The Changing Chinese Wood Products Consumer:

Opportunities and Challenges for the NZ Forestry Sector.

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ABSTRACT

The Chinese wood products market represents a significant opportunity for the New Zealand forestry sector, especially in the coniferous roundwood and sawn timber market. Despite the Sino-Russian agreement on wood products trade, which allows Russian suppliers have to only pay half of the normal value-added tax for their exports to China, New Zealand wood products still show competitiveness in the coniferous wood products market. However, lack of warehousing facilities and subsidiaries in China limit New Zealand's ability to access many small domestic industrial wood consumers. In addition, the exclusion of New Zealand pine from the current Chinese building and fire codes, prevents the use of New Zealand pine for wood framed residential housing. Moreover, the use of coniferous timber species is still not widely accepted in the domestic market in relation to the housing construction, interior decoration, and furniture sectors.

In order to promote New Zealand pine effectively, this study found that "*Price*" and "*Environmental Issues*" are the most important factors which will influence the Chinese industrial wood consumers to adopt a new wood-based product. Most respondents in this study indicate that the general managers and plant managers are final decision-makers in adopting a new wood product. Wood consumption behaviour of the industrial wood consumers varies by sector. Most respondents indicate that they are dependent on the domestic Chinese importers as their main sources of supply.

It had previously been found that the apparent consumption per capita of most wood-based panel products increase as the real GDP increases as in international market. This study does not have any statistical evidence to show whether the apparent consumption per capita of industrial roundwood and sawnwood increases with the Chinese real GDP. Furthermore, the apparent consumption of most wood products tends to be inelastic with respect to the adjusted average import and export prices. Other macroenvironmental drivers are likely to influence the demand of wood products in China.

Chapter 1 INTRODUCTION

The harvest volumes of New Zealand's plantation forest resource are predicted to increase considerably over the next decade. Domestic consumption per capita is expected to remain static implying an urgent need for the New Zealand forestry sector to expand or develop new markets for its wood products. Although Australia, the United States, Japan, and South Korea are the major destinations for New Zealand forestry products, the growth in these markets is expected to remain steady. With a potentially large "***wall of wood***" becoming available in New Zealand, the expansion of other potential markets is urgently needed for the New Zealand forestry sector.

China is one of the expanding markets for the New Zealand forestry sector. The deficit in industrial roundwood supply is estimated at 80 million m^3 in 2001 (USDA, 2002). The industrial wood consumers in the housing construction, interior decoration, and furniture sectors have been recognised as the most important wood consumers in China. However, the New Zealand forestry sector has limited information regarding these industrial wood consumers.

The purpose of this study is to examine the Chinese wood product markets, Chinese wood consumption behaviour, and the industrial wood consumers in the housing construction, interior decoration, and furniture sectors. The aim is to provide information to help utilise the significant opportunity for the export of surplus wood products to China.

Moreover, this study seeks to identify the types of wood products which are likely to increase if the Chinese real gross domestic product (GDP) per capita increases will be examined. The macroenvironmental drivers which are likely to influence the long-term prospects of Chinese wood consumption will also be examined.

1.1 AVAILABILITY OF NEW ZEALAND FORESTRY RESOURCES

According to the New Zealand Ministry of Agriculture and Forestry (2002), New Zealand's planted production forests covered an estimated 1.8 million ha as at 1 April 2001 (6.7% of the total area in New Zealand), of which radiata pine (*Pinus radiata*) is the dominant species, accounting for 89% of the planted area, followed by 6% in Douglas-fir, and 5% in other softwood and hardwood species.

The area of plantations has increased rapidly since the 1970s. Currently, the majority of the planted forest areas are privately owned,[1] with only a small proportion of the areas owned by the State (Figure 1.1).[2] Most of the new plantings since the 1970s are now maturing and expected to be harvested over the next few decades. The forecasted volume from 2001 to 2050 by base cut,[3] early cut,[4] and late cut [5] scenarios is shown in Figure 1.2 (New Zealand Ministry of Agriculture and Forestry, 2000). Although there are differences in target rotation age among the three scenarios, the forecasted wood supply increases to at least 30 million m^3 by 2015 under all scenarios.

[1] "Privately owned" includes all privately owned forests. The legal entities included in this category are private companies, partnerships, individuals and trusts, which include Maori trust and incorporations.

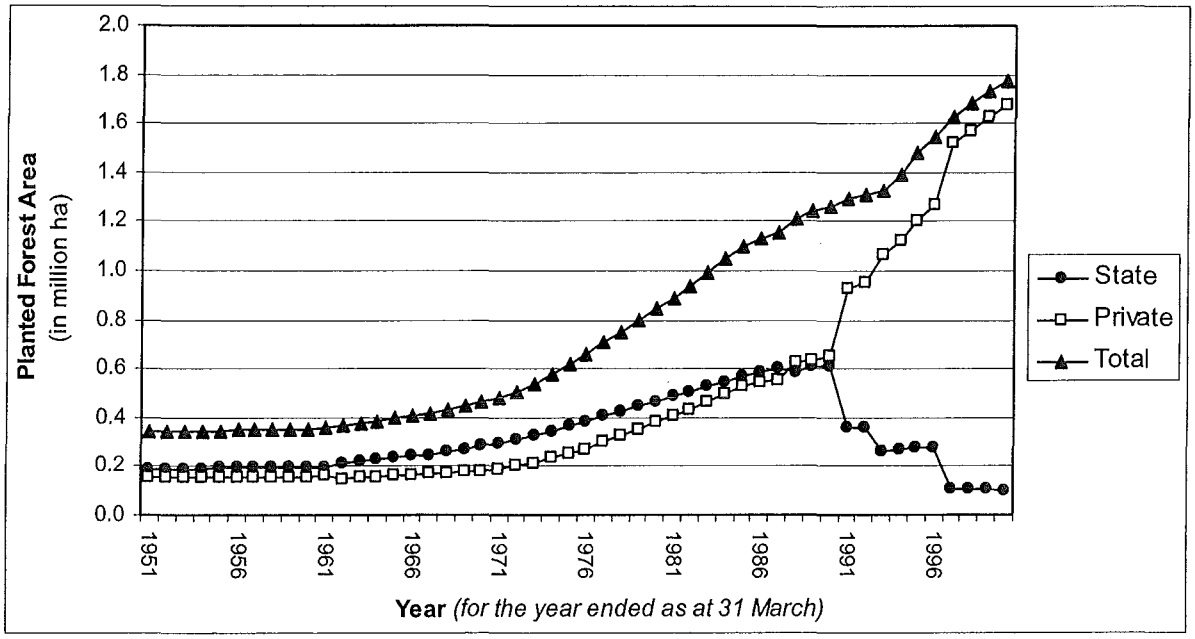
[2] **"State" refers to forest planted or managed by the New Zealand Forest Service or, since 1 April 1987, the state owned enterprises formed from the forest assets of the New Zealand Forest Service.**

[3] Base cut scenario targets clearfell age for radiata pine at year 28.

[4] Early cut scenario targets clearfell age for radiata pine at year 25.

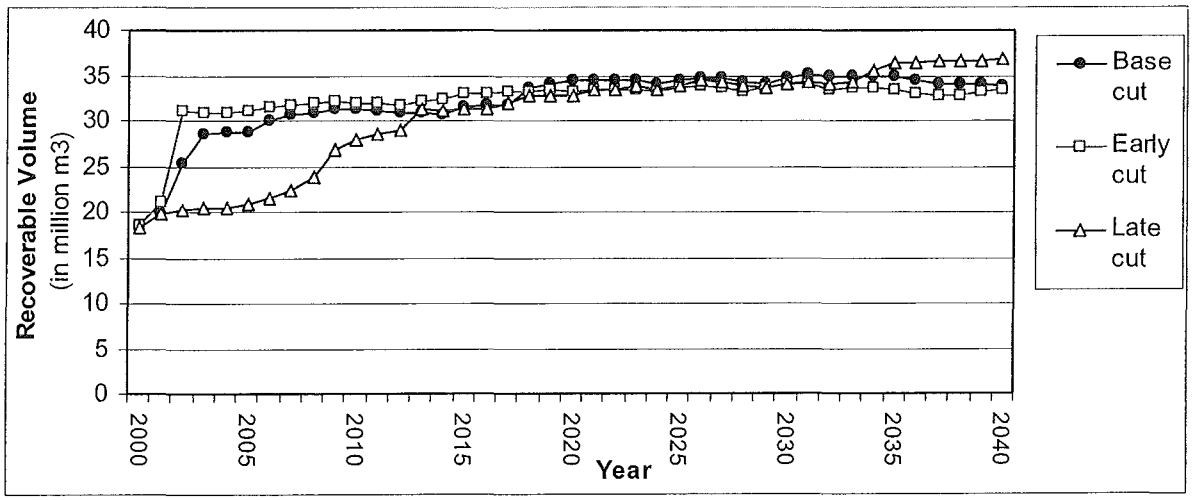
[5] Late cut scenario targets clearfell age for radiata pine at year 35.

Figure 1.1 The Total Planted Forest Area in New Zealand, 1951 – 2000.[6]



Source: New Zealand Ministry of Agriculture and Forestry (2002)

Figure 1.2 Forecast from 2000: Recoverable Volume by Base Cut, Early Cut, and Late Cut Scenarios.



Source: New Zealand Ministry of Agriculture and Forestry (2000)

[6] **"Private afforestation" figures before 1960 are based on incomplete historical data, and considerable estimation has taken place.**

1.2 DOMESTIC CONSUMPTION

New Zealand's domestic wood consumption has reached nearly 2 m^3 per capita, which is relatively high by world standards (Horgan & Maplesden, 1997). According to the New Zealand Forest Owners' Association (NZFOA, 2001), New Zealand domestic wood consumption was 8 million in 2000, and it is unlikely to exceed 10 million m^3 by 2040 based on the population projections and 1999 per capita consumption. Under the base cute scenario, an additional volume of 12.9 million m^3 will become available in New Zealand by 2010 in compared to 2000 (New Zealand Ministry of Agriculture and Forestry, 2000), implying that expansion of existing markets is urgently needed.

1.3 EXPORT DESTINATIONS

What is the potential for expansion of existing markets? Australia, Japan, and the United States have been New Zealand's major destinations for wood products by value (Figure 1.3).[7] Many market analysts predict that expansion of New Zealand wood products in these markets is limited.

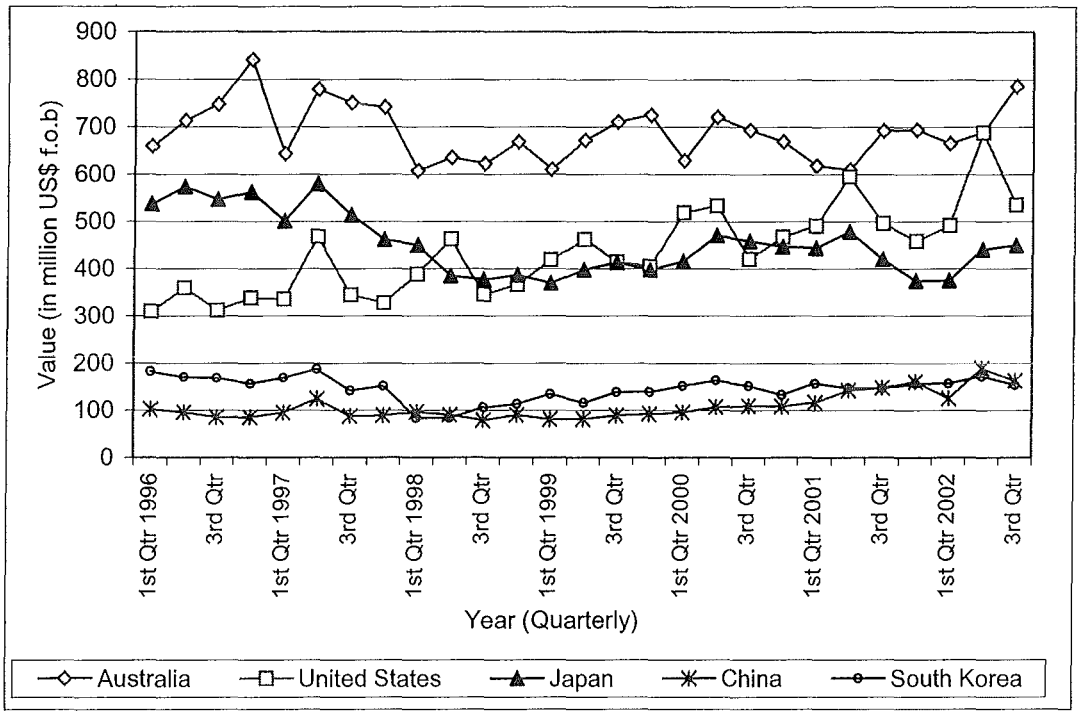
Prospects in Australia

The plantation forest area in Australia, New Zealand's most important wood products export destination, has increased considerably over the last 40 years. According to the Australia Department of Agriculture Fisheries & Forestry (2001), new softwood plantation areas doubled from 60,000 ha in 1965-1969 to 120,000 ha in 1970-1974. A new softwood plantation boom continued consistently at a rate of 150,000 ha for every 5-year period in 1975-1989.

[7] "Wood products" refers to all wood products which are classified in HS 44.

In 2000, the standing estate of total softwood in Australia was 972,000 ha, of which 73% is *P. radiata* (Australia Department of Agriculture Fisheries & Forestry, 2001). The Australian target to treble its (*softwood and hardwood*) plantation estate from 1 million ha in 1996 to 3 million ha by 2020, and to increase the competitiveness of the Australian forest industry, suggests that significant expansion of New Zealand exports is unlikely.[8]

Figure 1.3 New Zealand: Exports of Wood Products by Destination and Value (in million NZ$ f.o.b)[9]



Source: World Trade Atlas: Statistics New Zealand.

Prospects in Japan & South Korea

In the East Asia market, despite Japan remaining the world's second-largest economy, it is facing its longest economic downturn since World War II with deflation, banking system failure, and record high unemployment (Brooke, 2002).

[8] Plantations Australia. 1996. Plantations2020. (http://www.plantations2020.com.au/vision-brief.html) [13 February 2003]

[9] "Wood Products" refers to all wood products which are classified in HS 44.

In addition, Gaston *et al.* (2000) warn that the potential expansion in the domestic Japanese wood supply must not be ignored, as large volumes of both post-war and natural forest plantations are maturing. They estimate that there are 13.7 million ha of natural forests and 10.2 million ha of plantation forest in Japan. The growing stock of the natural forest is estimated to be 1.5 billion m^3, and the growing stock of plantation forest is approximately 1.4 billion m^3, with mean annual increment of 7.5 m^3 per ha (Gaston *et al.*, 2000). Moreover, they describe that the Japanese are very protective of their domestic industry; and end-users seem to have a higher preference for domestic species.

Although South Korea has recovered from the Asian Crisis in 1997, Kim (2002) reports that a slowdown in the construction industry and consumer spending may affect the future growth of the economy. In addition, Kim (2002) notes that burgeoning household debt is sparking anxiety about another crisis in the Korean banking sector.

Furthermore, the *"nuclear brinkmanship"* of North Korea has created another uncertainty in South Korea and Japan (Taylor, 2003). Japan and South Korea are the third and fourth most important export destinations of New Zealand forestry wood products by value (Figure 1.3).[10] As uncertainty arises in both Japan and South Korea, it is essential for the New Zealand forestry sector to diversify its market portfolio in the Asian region.

Prospects in the United States

The United States ranked as the New Zealand forestry sector's second most important export destination by value in 2000 (Figure 1.3). Although the value of exports to the United States has increased gradually, future political uncertainty is expected to slow down the economy (The Economist, 2002). In addition, the bubbling housing market could burst if the

[10] "Wood products" refers to wood products which are classified in HS 44.

labour market does not start recovering. In December 2002, Dettmer (2002) reported that house prices have climbed more than twice as fast as household incomes since 1998, the inventory of housing for sale is growing rapidly, and new housing starts have fallen for three straight months. As a result, Dettmer (2002) predicts that housing wood demand from the United States will remain uncertain in the short to medium-term.

The long-term prospect for wood products markets in Australia, the United States, Japan, and Korea is still positive according to Ogle & Miller (2000). However, if other potential markets are not developed for New Zealand's wood products, the growth in existing markets must increase significantly within the next 10 years in order to realise the significant economic investment in the plantation estate. With a potentially large "wall of wood" becoming available in New Zealand, most market analysts conclude that expansion into new markets is urgently needed for the New Zealand forestry sector.

1.4 Potential Market: China

The New Zealand forestry sector regards China as one of the most important expanding markets for its predicted forest product surplus. The opinion has been based on a predicted Chinese deficit in domestic supply of forest products, a large population base, and a fast growing economy. China is one of the potential new markets for the New Zealand forestry sector. In 1998, China announced a National Forest Conservation Programme (NFCP), with the aim of banning all logging activities in many regions and conserving 42 million ha of natural forest (Yang, 2001). The logging ban includes the areas of the upper reaches of the Yangtze River, upper and middle reaches of the Yellow River, Northeast China, Inner Mongolia, Xinjing Ugur Autonomous Region, and Hainan Province (Yang, 2001). One of the objectives is to "reduce the timber harvest from natural forest by 20 million ha (19.9

million m^3) from 1997 to 2003."[11] The total area of forest cover in China was 164 million ha in 1996, including 40 million ha of plantation forests.[12] With the implementation of the logging ban, a significant proportion (one-third of the 124 million ha) of natural forest cover in China will be reserved.

China has a population of over 1.26 billion, and its nominal GDP grew at an average of 8.3% per annum between 1995 and 2000 (International Monetary Fund, 2002). If this economic growth continues, the total "wood" demand[13] is expected to increase in the next decade (Zhang *et al.*, 1997). There are various estimates of the deficit in industrial roundwood supply,[14] ranging from 60 million m^3 by 2010 (Zhang *et al.*, 1997) to 80 million m^3 in 2002 (USDA, 2002).[15]

Despite these variations, the future deficit is expected to increase substantially with imports of wood products from other countries being the only option to satisfy the supply shortfall in China (USDA, 2001b). Hence, China presents a significant opportunity as a potential expanding market for the industrial roundwood supply from New Zealand. In addition, China's accession to the WTO, following deregulation and removal of import barriers, and fuelled by the increase in real GDP per capita, is likely to provide more opportunities for the New Zealand forestry sector.

Although there are many publications available in relation to the Chinese wood products market (Sun *et al.*, 1999; Zhang *et al.*, 1998; Hammett & Sun, 1997; and Li, 1997; Zhang *et al.*, 1997), much of this information needs to be updated. For example, the implementation of the logging ban in 1998 and the fast growing economy have driven the industrial wood

[11] Source: Yang (2001). It does not state whether this figure is on an annual basis.
[12] Source: Food and Agriculture Organization. 1996. Country Profile. (http://www.fao.org) [15 October 2002]
[13] Total "wood" demand in Zhang *et al.* (1997) refers to all industrial roundwood and fuelwood.
[14] "Deficit in industrial round wood supply" refers to the differences between demand and supply.
[15] The assumption has been made that total industrial "timber" = total industrial roundwood in USDA (2000).

consumers from natural forests to domestic plantation and imported timber species. There are few publications that describe China's potential market from the perspective of New Zealand exporters, and the literature is also lacking in its description of both current and future consumers in China.

USDA (2002) describes that the housing construction, interior decoration, and furniture sectors are the most important wood consumers in China. In order to utilise the significant opportunity for increased wood products exports to China, the New Zealand industry requires a more up-to-date and analytical approach to understanding the market and its consumers. This thesis aims to answer the question:

DOES THE CHINESE MARKET REPRESENT A SIGNIFICANT OPPORTUNITY FOR A SUBSTANTIAL INCREASE IN EXPORTS OF NEW ZEALAND'S WOOD PRODUCTS[16] IN THE NEXT DECADE?

Three objectives were developed in order to explore the background and identify the potential opportunities in the Chinese wood products market.

1. **The first objective** is to review the current market situation in the Chinese wood products market. (*see Chapter 3*)
2. **The second objective** is to understand how New Zealand forestry organisations are conducting business in China. (*see Chapter 4*)
3. **The third objective** is to examine the wood consumer behaviour of the final consumers and the industrial wood consumers in relation to the housing construction, interior decoration, and furniture sectors in China. (*see Chapter 5*)

[16] "Wood Products" refers to all the wood products that are classified under HS 44 (harmonization code 44) because only wood products classified under HS 44 are relevant to the housing construction, interior decoration sector, and furniture sectors.

Most New Zealand forest products exporters target the industrial wood consumers in the housing construction, interior decoration, and furniture sectors. Due to the fact that trees are already in the ground in New Zealand, markets and customers must be chosen to align with the product range that can be processed from the near-mature resource with given specifications (Cartwright, 2001). Understanding these industrial wood consumers is urgently needed to allow the New Zealand forestry sector to align its wood products to these potential industrial wood consumers, especially as Cai (1998) and many New Zealand wood products marketers indicate that negative perceptions and lack of knowledge about New Zealand pine is widespread among Chinese industrial wood consumers.

In order to promote New Zealand wood products effectively in the Chinese wood products market, identifying the most important factors that influence the industrial wood consumers to adopt a new wood product, and increasing the knowledge of these industrial wood consumers are essential in formulating a promotion strategy to override the Chinese industrial wood consumers' negative perceptions on New Zealand's forestry products.

4. **The fourth objective** is to increase the understanding of industrial wood consumers in relation to the housing construction, interior decoration, and furniture sectors (*see Chapter 6*):

    a) identify the factors that will influence these industrial wood consumers to adopt a new wood product;
    b) identify the stakeholders involved during the decision-making process;
    c) examine the wood consumption behaviour of these industrial wood consumers; and
    d) examine their distribution channels from sources of supply to their consumers.

Apart from the microenvironment within these industrial wood consumers, the consumption of wood products is usually influenced by other macroenvironmental drivers (Solberg, 1996). According to Buongiorno *et al.* (2001) and Solberg (1996), gross domestic product (GDP) per capita, is the main influencer of the wood consumption per capita. It can be used to measure the wealth of a country (Buongiorno *et al.*, 2001) and the income elasticity (Amor & Lattimore, 1999). China's real GDP (in 1999 prices) has increased by an average of 10% per annum between 1990 and 2000 (Asian Demographics Limited, 2001). The estimation of income elasticity would be useful to examine the likely changes of the Chinese wood consumption with respect to future changes in real GDP.

Zhang *et al.* (1997) estimated the income elasticities of industrial roundwood, sawnwood, and wood-based panel products in China. Indeed, Zhang *et al.* (1997) does not differentiate the wood products into coniferous (softwood) or non-coniferous (hardwood). Moreover, they combine all the wood-based panel products (i.e. fibreboard, particleboard, plywood, veneer sheets) into a single category. As a result, the income elasticity for an individual wood product was not examined.

Meanwhile, there is not much literature which estimates the income elasticity of wood products in China. If the Chinese real GDP per capita increases, understanding the income elasticity would be useful for identifying whether the various wood products in China are either normal or inferior goods.

5. **The fifth objective** is to estimate the income elasticity in the Chinese wood products market with respect to the real GDP per capita. (*see Chapter 7*)

Apart from GDP per capita, there are other macroenvironmental factors which are likely to influence future wood consumption in China. According to Rao & Steckel (1998) and Kotler & Armstrong (1999), macroenvironmental factors such as economic, political, socio-demographic, technological, and environmental drivers would highly influence the consumers in a specific targeted market.

6. **The sixth objective** is to identify the impact of macroenvironmental drivers (economic, political, socio-demographic, technological, and environmental) of change which are likely to influence future wood consumption in China. (*see Chapter 8*)

1.5 THESIS STRUCTURE

In order to examine the Chinese wood products market and the industrial wood consumers, this thesis consists of nine chapters:

- **Chapter 1: INTRODUCTION** – provides a rationale for this thesis and the objective of the study.
- **Chapter 2: RESEARCH METHODOLOGY** – explains the research methodology used to achieve the six objectives in this thesis.
- **Chapter 3: CHINESE WOOD PRODUCTS MARKET** – reviews the Chinese production, consumption, and import statistics on Chinese wood products market, including consumption by end use.
- **Chapter 4: NEW ZEALAND EXPORT EXPERIENCE** – examines the current situation regarding three New Zealand forest organisations conducting business in China.
- **Chapter 5: WOOD CONSUMER BEHAVIOUR** – reviews the literature on end users and industrial wood consumers in relation to the housing construction, interior decoration, and furniture sectors.
- **Chapter 6: INDUSTRIAL WOOD CONSUMER SURVEY** - presents the results of a survey that targets industrial wood consumers (*wood processors and construction contractors in housing construction sector, interior decorating materials manufacturers; and furniture manufacturers*). This chapter

A) identifies the most important factors that will influence the industrial wood consumers to adopt a new wood-based product, and the likely organisational characteristics that might influence decisions in these industrial market segments;
B) identifies the stakeholders who are involved in the decision-making process to adopt a new wood product;
C) examines the wood consumption behaviour of the industrial wood consumers; and
D) examines the distribution channels of these industrial wood consumers from source of origin to their customers.

- **Chapter 7: INCOME ELASTICITY** – examines how the macroenvironmental driver, GDP, influences the consumption of wood products in the Chinese market. The income elasticities of several selected wood products with respect to the real GDP (prices = 1999 in RMB¥) are estimated in this section.

- **Chapter 8: MACROENVIRONMENTAL DRIVERS** – examines the other macroenvironmental drivers in terms of economic, political, socio-demographic, technological, and environmental issues that are likely to influence the future wood consumption in China.

What are the likely changes in the Chinese wood consumers in the next 10 to 15 years? What are the opportunities that can be identified from the results of the six objectives in this study? What is likely to be a successful future strategy for the New Zealand forestry sector in the Chinese wood products market? In order to answer these questions and summarise the results from this study:

- **Chapter 9** concludes and discusses the opportunities, constraining factors, and risks that will influence the New Zealand forestry sector in the next 10 to 15 years. In addition, future strategies for the New Zealand forestry sectors in the Chinese wood products market will be recommended at the end of this chapter.

Chapter 2 METHODOLOGY

Quantitative and qualitative approaches were used to analyse the Chinese wood products market with respect to the New Zealand forestry sector. This chapter aims to outline and describe the methodology used in this thesis to achieve the six objectives, which were described in Chapter 1. In addition, the study limitations will also be discussed.

In this study, the currencies used are either the Chinese currency Renminbi, unit Yuan (RMB¥) or the US dollar (US$). The exchange rate (US$ 1 to RMB¥ 8.3) was consistently used throughout this study unless specified (International Monetary Fund, 2002).

2.1 CHINESE WOOD PRODUCTS MARKET (Chapter 3)

In order to understand the wood products market in China, the supply-side factors (*production* and *forest resources*), and the demand-side factors (*consumption by end-use*, *apparent consumption per thousand capita*, and *imports*)[17] were examined. The supply and demand gaps were examined in order to identify a significant opportunity for the New Zealand forest products exporters.

Supply-Side Factors: Production & Forest Resource

Forest resources (*natural forest and state-owned plantation forests*) and production statistics (*state-owned enterprises only*) were extracted from China Ministry of Forestry (2000). The Chinese forest resources and production statistics are widely regarded as being unreliable because they only include the State planting and production from the state-owned enterprises. The private plantations and production are not recorded in the official statistics.

[17] Buongiorno *et al.* (2001) state that **Apparent consumption = Domestic Production + Imports – Exports**, "Imports" in this study is defined as a demand-side factor as imports increases the apparent consumption.

However, these statistics were the only official data which could be obtained in China and have been used in this analysis.

Demand-Side Factors: Consumption by End-use; Apparent Consumption per Thousand Capita; and Imports

The housing construction, interior decoration, and furniture sectors are the most important wood consumption sectors in China (USDA, 2002). Understanding these sectors is very important to examine the potential opportunity for New Zealand wood products exporters. As a result, the end-uses of housing construction, interior decoration, and furniture sectors were examined through literature reviews.

As a qualitative approach does not necessarily provide any analytical information for wood consumption in China, a quantitative approach was also used to calculate the apparent consumption per thousand capita from FAOSTAT database.[18] In addition, in order to identify the distinctive features between the wood consumption behaviour in China and New Zealand, the apparent consumption per thousand capita between 1991 and 2000 for selected products for both countries was examined.

The apparent consumption per thousand capita of selected wood products in China and New Zealand were calculated by the sum of production and imports minus exports per thousand capita. The differences of the apparent consumption per thousand capita in both countries were examined. New Zealand, a western country, was chosen in order to compare with China, a developing country. The selected wood products categories were: industrial roundwood (*coniferous and non-coniferous*), sawnwood (*coniferous and non-coniferous*), fibreboard, plywood, particleboard, veneer sheet, all wood-based panel products, and

[18] Source: FAO (2001) Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/ collections?subset=forestry) [15 November 2001]

sawlogs & veneer logs (*coniferous and non-coniferous*). Definitions of these selected wood products can be found in Appendix 2.4.

The demand for imported wood products can be quantified by import statistics, which were collected by China Customs and obtained via the World Trade Atlas database.[19] In the World Trade Atlas database, each commodity is classified with a harmonization system code (***HS code***) according to the World Custom Organization.[20] According to the current HS coding classification, all wood and wood products are classified under section four[21] and divided into a 2-digit HS coding system (i.e. HS 44, HS 45, and HS 46). HS 44 refers to wood and wood articles, HS 45 refers to cork and articles, and HS 46 refers to the manufacture of straw. In this study, only wood and wood products classified in HS 44 (wood and wood articles) were examined because only products in this category are relevant to the construction, interior decoration, and furniture sectors (Yang, 2001).

Firstly, in order to examine the trade statistics, the Chinese import statistics (*import value, quantity, and average price*) for the year ended July were extracted from the World Trade Atlas database under HS 44. Due to the fact that the 2-digit HS code does not provide enough information for analysis, trade statistics were extracted under the 4-digits HS codes from the World Trade Atlas database.

Secondly, under the 4-digit HS coding system, the statistics showed that wood products HS 4403 (industrial roundwood), HS 4407 (sawn timber), HS 4412 (plywood), HS 4411 (fibreboard), HS 4408 (veneer), and HS 4410 (particleboard) were the major wood products imported into China since 1996. The value of these wood products accounted for 97% of

[19] World Trade Atlas database is a trade information system which managed by Global Trade Information Service Inc. The trade statistics are sourced from China Customs.
[20] Source: World Customs Organization. 2002. (http://www.wcoomd.org/ie/En/en.html) [20 December 2002]
[21] Source: World Customs Organization. 2002. (http://www.intelepages.com/Harmonized_Codes/Commodity_Classification.htm) [20 December 2002]

total imports value of wood products (*under HS 44*) for the year ended July 2001. As a result, this study has focused on these wood products.

Finally, wood products can be further divided into coniferous (*softwood*) or non-coniferous (*mostly hardwood*), and fibreboard can be categorised by density. Therefore, import statistics with 6-digit HS code were extracted from the World Trade Atlas database for selected wood products in China.

Study Limitation

As described earlier, the official forest resources and production statistics from China do not include the plantations and production from the private sector. It is likely that the forest inventory and production capacity in China are underestimated because foreign investment has been actively involved in private plantations and processing in the Chinese forestry sector (USDA, 2002).

Production statistics from the FAOSTAT database tend to be more accurate than the statistics from China Ministry of Forestry (2000) as they include statistics from government and the private sector. However, series for some wood product categories such as medium density fibreboard (MDF), and sawlogs and veneer logs were not consistently available since the late 1980s because these statistics were not available. As a result, only wood products categories that have a complete series from the late 1980s to 2000 were analysed.

Import statistics for selected wood products from China Customs through the World Trade Atlas were examined. There has been some controversy regarding the accuracy of the statistics from China Customs. For instance, there are discrepancies between the export statistics from New Zealand and import statistics into China even for the same wood product with the same HS code. The import statistics reported from the China Customs were consistently higher than the New Zealand export statistics; moreover, these discrepancies also occurred with the Australia export statistics. Despite the discrepancies, in order to compare the performance of other countries in the Chinese wood products market and in the absence of any alternative data, the statistics from the China Customs were used.

Furthermore, illegal exports of wood products from Russia to China will distort the import statistics for China. However, an assumption has been made that the errors created by the China Customs are consistent across all countries.

2.2 New Zealand Export Experience (Chapter 4)

In order to obtain an up-to-date account of New Zealand forest products exporters' experiences in conducting business in China, it is important to collect in-market information from the exporters. Individuals from three New Zealand organisations that have been involved in exporting wood products to China were interviewed to ascertain the current in-market situation and discuss the difficulties that arose in exporting New Zealand wood products to China.

Nature of the Interview

The four individuals were interviewed between March and April 2002 by personal visit, telephone, and e-mail. Details of these individuals and their organisations are given in Table 2.1.

Table 2.1 Details of the Three Interviewees in the New Zealand Forestry Sector.

Name of respondent	Affiliation(s)	Name of Organisation(s)	Location	Date	Nature of correspondence
Giller, B	Group Marketing Manager	Craigpine Timber Limited	Winton	24 March 2002	Telephone
	Chairman	New Zealand Pine Exporting Companies (*NZPEC*)[22]			
Hunt, G.	Former Chief Executive	Wood New Zealand Limited[23]	Auckland	4 April 2002	Telephone
Lu, B		Ecomex Limited	Auckland	4 April 2002	Telephone
Janett, D.		Janett & Associates	Christchurch	8 April 2002	Personal visit

These individuals were selected for interview because they had or have been conducting business and promoting New Zealand pine in China. For instance, Mr Giller from Craigpine Timber Ltd has been employed in the role of Marketing Manager for 19 years and has been extensively involved in the development in the Asian markets. Currently, Mr Giller is also the Chairman of New Zealand Pine Exporting Companies (**NZPEC**).

Mr Hunt was both the founder and Chief Executive of Wood New Zealand Limited (July 1999 – September 2000). Wood New Zealand Limited was a co-operative marketing venture to promote New Zealand wood products in China, but it was dis-established as at 1st September 2000.

[22] Note: **NZPEC** *is a group of 15 lumber companies working together to open up market in Asia.* They are supported "in-country" by government agency Trade New Zealand, and back home by the Timber Industry Federation and New Zealand Pine Manufacturers' Association.

[23] Note: The objective of **Wood New Zealand** (July 1999-September 2000) was to establish in-market trade promotion offices to improve contact between suppliers and potential customers.

Mr Lu who was referred by Mr Hunt, is working with Mr Hunt in Ecomex Limited, a New Zealand-developed electronic commodity exchange for wood. He has many years of experiences in logs exports to China.

Mr Janett has been employed in the forest industry for more than 13 years. The core business of his company, Janett & Associates, includes harvesting and supply of unprocessed logs to the domestic and export markets.

Interview Structure

The interviews were structured according to the approach of Kotler & Armstrong (1999):

a) Background of the organisation and Situation Analysis
b) Problem Definition
c) Possible Solutions and Recommendations.

A set of questions was constructed and asked during the interviews:

- What are the background and objective(s) of the organisation?
- What are the products (objective)? Who are the customers? What are their end-uses?
- How are products distributed to their customers?
- What are the factors influencing Chinese consumers to adopt New Zealand wood products? What are the keys to success in conducting business in China?
- What are the problems and difficulties when using New Zealand pine in China (*in terms of changes in technology, price, service, policy, etc.*)?
- What are the possible solutions to solve these problems or difficulties?
- Who are the competitors in the market? What are the strengths and weaknesses of your products made from New Zealand pine?
- What is your organisation's (or New Zealand's) future prospects in the Chinese wood products market?

2.3 Wood Consumer Behaviour: End-Users & Industrial Wood Consumers (Chapter 5)

Since China's open-door policy and its accession to the WTO, consumers have been the major driving forces of the wood products market, not importers with import licences (Sun *et al.*, 1999). Wood products consumers can be categorised into: end-users and industrial wood consumers (Hammett & Sun, 1997). In this study, end-users refer to the final customers of wood products whereas industrial wood customers refer to the manufacturers or wood processors. Understanding the behaviour of these consumers is important in identifying whether there is a significant opportunity for New Zealand exporters in the Chinese wood products market.

End-Users

End-users' wood consumer behaviour in China was examined in relation to the housing, interior decoration, and furniture sectors. The categories compared were based on Gaston *et al.* (2000) who analysed consumer behaviour in Japan in relation to the trends in housing, interior decoration, and wood furniture markets as given below.

- Housing
    - Percentage of wood frame houses
    - Uses of wood-based products in construction
- Interior Decoration
    - Flooring
    - Doors
- Wood Furniture
    - Uses of hardwood & softwood
    - Knots

End-users' consumer behaviour was summarised from personal communications, industrial magazines, newspapers, and market research publications.

Industrial Wood Consumers

A literature review of industrial wood consumers in the housing construction, interior decoration, and furniture sectors was conducted.

2.4 INDUSTRIAL WOOD CONSUMERS SURVEY *(Chapter 6)*

The New Zealand forestry sector has limited knowledge about the factors that will influence Chinese industrial consumers to adopt a new product. The stakeholders who are involved during the decision-making process are often unknown by many exporters. Furthermore, wood consumption behaviour, distribution channels, and end-uses of the industrial wood consumers are likely to have changed considerably in recent years. Therefore, an industrial wood consumer survey was conducted to ascertain the industrial wood consumers in relation to the housing construction, interior decoration, and furniture sectors.

2.4.1 Questionnaire Design

The primary objective of the questionnaire was to identify the most important factors that will influence Chinese industrial wood consumers to adopt a new wood product, and to identify the stakeholders who are involved in the decision-making process.

The secondary objective was to examine the wood consumption behaviour regarding volume used, species used, types of wood products used, distribution channels, final end markets, and collect other useful information from the industrial wood consumers.

Three sets of questionnaire were designed (Appendix 2.1, Appendix 2.2, and Appendix 2.3) to examine each of the housing construction, interior decoration, and furniture sectors respectively in southern China, where most of these sectors have been clustered since the early 1990s. Questionnaires were translated into Chinese.

Targeted Respondents

Four main groups of industrial wood customers were targeted in this study. Categories of industrial wood customers were: **wood processors**, and **construction contractors** in the housing construction sector, **interior decorating material (*wood-based*) manufacturers** in the interior decoration sector, and **furniture manufacturers** (wood-based) in the furniture sector.

Respondents in the housing construction sector can be classified into two categories. The first category is the construction contractors who are involved in construction of housing units. The second category is the wood processors who produce wood products for construction purposes.

Respondents in the interior decoration sector can be defined as the manufacturers of all wood-based materials which are used for functional and decorative purposes to complete the interior of a housing unit. For example, mouldings, flooring, doors, windows, and kitchen sets.

Respondents in the furniture sector can be defined as the furniture manufacturers of (wood-based) indoor furniture manufacturers. For example, dinning tables, chairs, cabinets, sofas, and beds.

Factors Influencing Industrial Wood Consumers to Adopt a New Wood Product

In order to identify the most important factors that will influence the industrial wood consumers to adopt a new wood product, respondents were invited to consider the importance rating of the eight determinant factors (**A** to **H**). The eight determinant factors are: **A.** *Wood Properties*;[24] **B.** *Price*; **C.** *Availability*;[25] **D.** *Product Quality*;[26] **E.** *Services*;[27] **F.** *Environmental* Issues;[28] **G.** *Customer Preferences*; and **H.** *Other User's Experiences*. The importance rating is scaled from 1 to 9, where 1 refers to the least important factor and 9 refers to the most important factor.

Price and environmental issues were chosen as two of the eight determinants because Sun *et al.* (1999) describe that Chinese industrial wood consumers ranked price as most important whereas sustainability was least important of issues among hardwood furniture manufacturers. However, their study was undertaken during 1997 and 1998 prior to the announcement of the logging ban and the rising concerns of environmentalism in China and in the global wood products market. The rising environmentalism in the international markets may have forced the industrial wood consumers to adopt environmentally certified wood products.

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[24] **Wood Properties** refers to *wood density; surface hardness; compressive strength; good nailing properties; light in weight, ease of handling; and smooth surface area (fine grain).*

[25] **Availability** refers to *availability of a regular product supply, and ability to offer different product favourites.*

[26] **Product quality** refers to *consistency of specified sawn dimensions; consistency of specified short-end diameter; and free of sapstain.*

[27] **Services** refers to *reliability of delivery; provide technical assistance; provide credit and flexible payment terms.*

[28] **Environmental issues** refers to *provide an official approved sustainability certificate.*

Various industry sources indicate that wood properties, availability, product quality, services, and customer preferences are likely factors that will influence the Chinese wood consumers to adopt New Zealand wood products (see ***Chapter 4***).[29] As a result, these factors were chosen as part of the eight determinant factors.

Furthermore, "*experiences from other users*" was chosen as one of the eight determinants because understanding whether information about New Zealand wood products can be delivered through word-of-mouth is useful for advertising and promotion.

In order to include other possible factors that will influence the respondents to adopt a new wood product, an open-ended question was asked at the end of the eight determinant factors.

Organisational Characteristics

Chinese industrial wood consumers were already segmented into housing construction, interior decoration, and furniture sectors by the questionnaires. According to Sun *et al.* (1999), firm size would influence furniture manufacturers to adopt a new wood product. Moreover, USDA (2000) and Li (1997) described that other organisational characteristics such as number of employees and technology levels would also influence the industrial wood consumers to adopt a new wood product. As a result, the questionnaires were designed to examine some of the organisational characteristics. The organisational characteristic and the attributes within each organisational characteristic are summarised in Table 2.2.

[29] See the details of the interviewees in Table 2.1

Table 2.2 The Different Organisational Characteristics and Attributes Examined in this Study.

ORGANISATIONAL CHARACTERISTIC	*Attributes within each Organisational Characteristic*
SECTOR	Housing construction: *Wood Processors,* and *Construction Contractors*
	Interior decoration
	Furniture
OWNERSHIP	State (State-owned)
	Private (Privately owned, not listed in the stock market)
	Shares (Shareholders owned, listed in the stock market)
	Co-operative (Owned by many members of an entity with no passive shareholders)
	Other (= joint venture between foreign and domestic companies)
ANNUAL TURNOVER	Less than RMB¥ 10 million
	Between RMB¥ 10 to 50 million
	More than RMB¥ 50 million
NUMBER of EMPLOYEES	Less than 30 employees
	Between 30 to 100 employees
	More than 100 employees
Combination of Annual Turnover in 2001 & Number of Employees	Less than RMB¥ 10 million & Less than 30 employees
	Less than RMB¥ 10 million & Between 30 to 100 employees
	Less than RMB¥ 10 million & More than 100 employees
	Between RMB¥ 10 to 50 million & Less than 30 employees
	Between RMB¥ 10 to 50 million & Between 30 to 100 employees
	Between RMB¥ 10 to 50 million & More than 100 employees
	More than RMB¥ 50 million & Less than 30 employees
	More than RMB¥ 50 million & Between 30 to 100 employees
	More than RMB¥ 50 million & More than 100 employees

Who are the Stakeholders in the Decision-Making Process to Adopt a New Wood Product?

In order to identify the stakeholders involved in the decision-making process to adopt a new wood product, two open-ended questions were used to ask the respondents who is the final decision-maker, and who are the other influencers during the decision-making process.

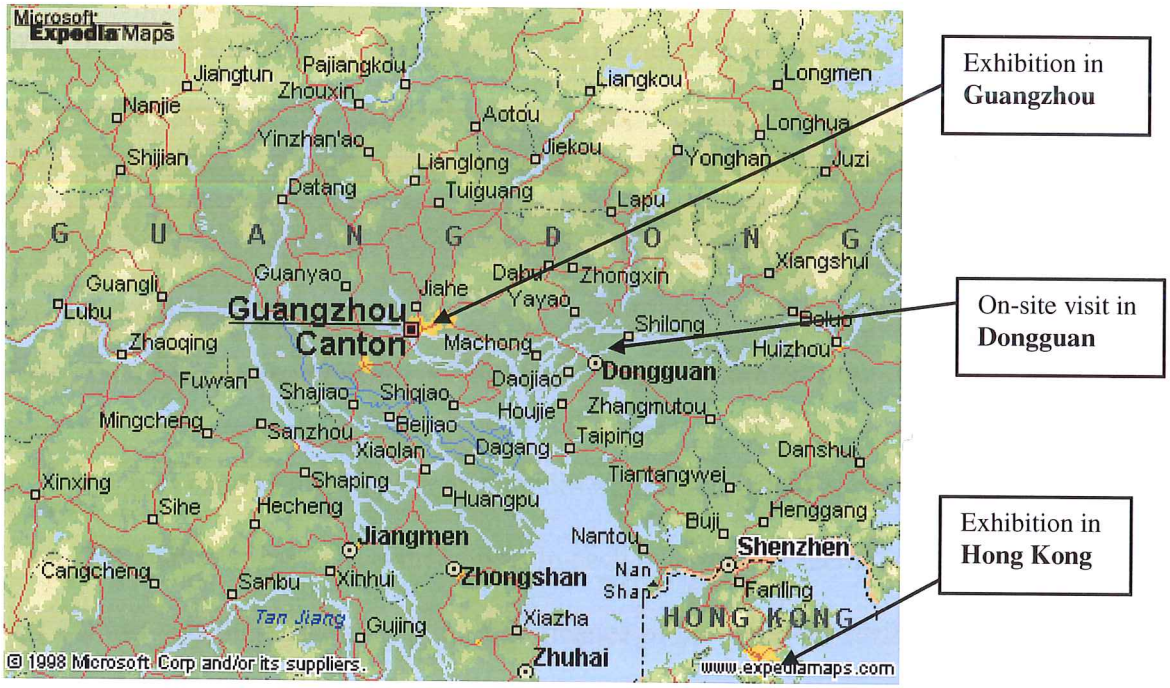
Wood Consumption Behaviour (Volume, Species, Types of Wood Products Used), Distribution Channels; and End-Use Markets

The questionnaires were designed to examine the annual volume, the species, and type of wood products used by the respondents. In addition, the questionnaires examined the distribution channels and the final end-markets of the respondents.

2.4.2 Survey Procedure

Three hundred questionnaires were distributed during two exhibitions and an on-site visit in Dongguan. The survey was conducted during two exhibitions, one in Hong Kong (*Hong Kong Convention Centre*) and one in Guangzhou (*Guangzhou Commodities Centre*) in June and July 2002 respectively. In addition, some respondents, who were interested in participating and indicated that they did not have time during the exhibitions, were revisited on-site during June and August 2002. On-site visits were mainly concentrated in southern China (Figure 2.1). The popular "furniture manufacturing town" (USDA, 2001a) in Dongguan was also visited.

Figure 2.1 Locations of Guangzhou, Hong Kong, and Dongguan in southern China.[30]



[30] Source: Hong Kong City University (http://www.cityu.edu.hk/lib/collect/prd/maps/map_prd.htm) [4 March 2002]

2.4.3 Analysis of Questionnaires

All the procedures used to analyse the results are summarised Figure 2.2.

Independent-sample t-test

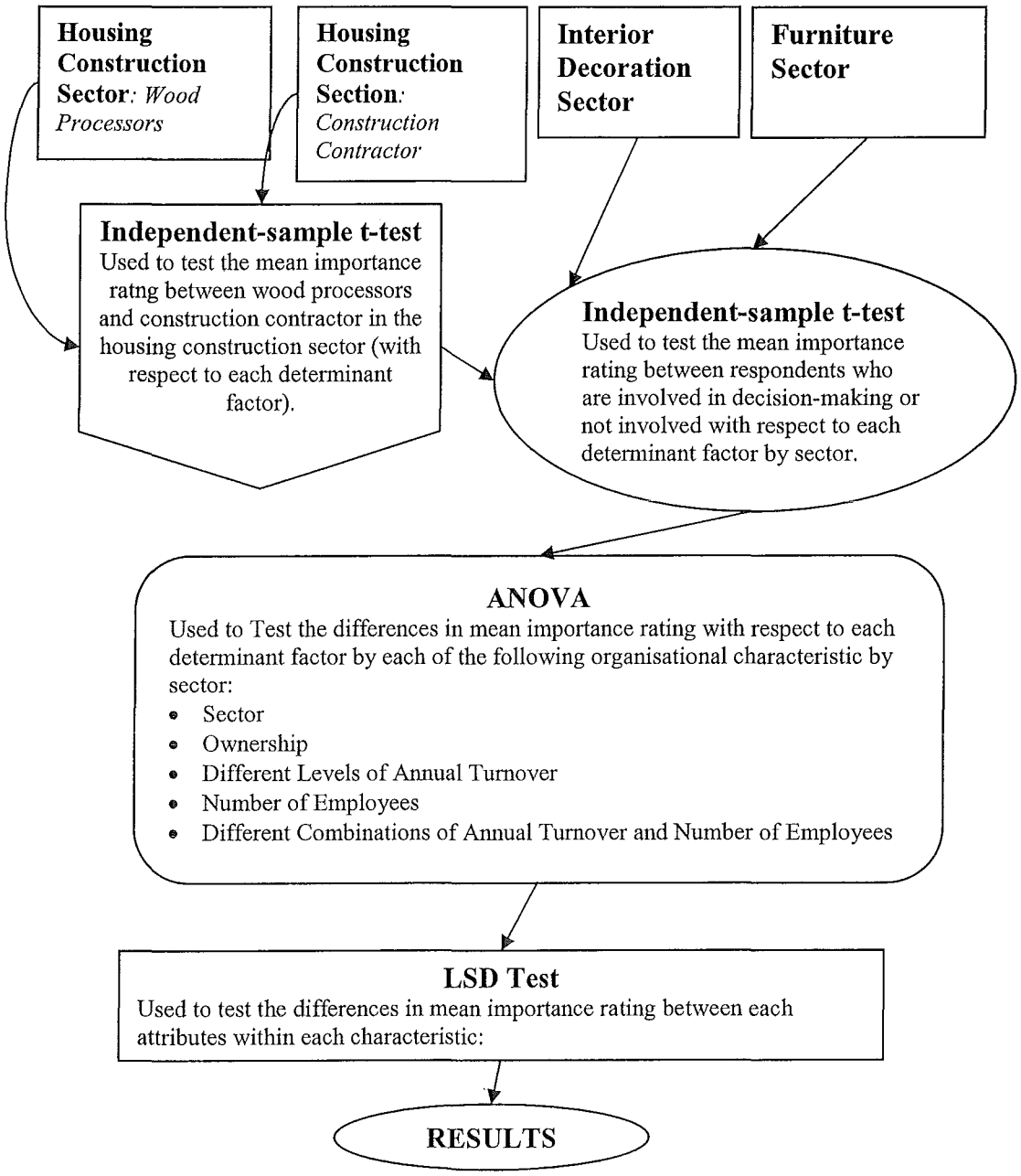
Firstly, in the housing construction sector, two groups of targeted respondents were identified from the survey (Table 2.2). An independent-sample *t-test* was used to test whether the importance ratings given by all the respondents were independent regardless of whether they were wood processors or construction contractors.

Secondly, an independent-sample t-test (Lewis & Ford, 1983) was used to test whether there were any differences in the mean importance rating between the respondents who are involved in the decision-making process and respondents who are not involved in the decision-making process.

Differences in Mean Importance Ranking by Each Organisational Characteristic and different Attributes

ANOVA was used to identify the differences in mean importance ratings (**1** to **9**) by each organisational characteristic with respect to each determinant factor (**A** to **G**) by each sector. A LSD test was then used to test the significance of the different attributes within each characteristic. The different attributes within each characteristic are listed in Table 2.2.

Figure 2.2 Analysis of Questionnaires.



Capital-Intensive and Labour-Intensive

According the USDA (2002), the technology capability of industrial wood consumers will influence wood consumers in adopting a new wood product. For example, Sun *et al.* (1999) reported that a higher proportion of large firms ranked "straightness of the grain" as the most important factor influencing the furniture manufacturers to adopt a new hardwood sawn timber (or dimension) supply than the medium and small companies. Sun *et al.* (1999) describe that it might be the fact that larger firms are equipped with modern technologies, and they preferred wood products which can easily facilitate mass production. Therefore, the purpose of this section is to describe the procedures used to test whether the differences in mean importance rating are influenced by the technology level of the respondents.

Sun *et al.* (1999) used annual turnover to measure the technology level of firms. However, technological constraints on firms include inputs such as capital, labour, and raw materials (Varian, 1999). Using annual turnover alone might not be able to reflect the difference in technology of the targeted industrial wood consumers.

Unfortunately, a direct measure of technology was not included in the questionnaire. An alternative method was used to combine the annual turnover and number of employees into either **capital-intensive** or **labour-intensive** categories to represent the technology level of the respondents. The concept is slightly similar to the comparative advantage theory in Krugman & Obstfeld (2000). If a company uses a higher ratio of labour to achieve the same level of annual turnover, the company is classified as a labour-intensive company. In contrast, if a company uses a lower ratio of labour to achieve the same level of annual turnover, the company is classified as a capital-intensive company.

In order to measure whether the respondents are relatively capital or labour-intensive, three assumptions have been made:

- The **first assumption** is that a company's annual turnover is a function of capital (K) and labour (L).
- The **second assumption** is that the annual turnover is proportional to a company's capital (K) investment up to a certain limit. Companies with a higher capital investment will have a higher annual turnover up to a certain limit.
- The **third assumption** is that the number of employees (L) is proportional to a company's labour investment up to a certain limit. Companies employ more labours will have a higher annual turnover up to a certain limit.

The procedures of the alternative method can be described as follows:

Step 1: In the questionnaires, three different level of annual turnover and three different categories of number of employees were established as follows:

Symbol K_i	**Annual Turnover** (*million RMB Yuan*) **in 2001**	*Symbol* L_j	**Number of Employees**
K_1	Less than RMB 10 million Yuan	L_j	Less than 30 employees
K_2	RMB 10 to 50 million Yuan	L_2	30 to 100 employees
K_3	More than 50 million Yuan	L_3	More than 100 employees

The annual turnover in 2001 and the number of employees of the respondents were categorised in the questionnaires. These categories were transformed into different levels of capital-use (K_i) and different levels of labour-use (L_j), where $i = 1$ to 3 and $j = 1$ to 3, and 1 = the least intensive and 3 = the most intensive.

Step 2: Nine different combinations were possible by combining the characteristics (the different levels of annual turnover and the number of employees). For example, K_1L_1, K_1L_2, K_1L_3, ..., K_iL_i, where i = 1 to 3 and j = 1 to 3. By listing all the possible combinations (K_1L_1, K_1L_2, K_1L_3, K_2L_1, K_2L_2, K_2L_3, K_3L_1, K_3L_2, K_3L_3), these combinations were grouped:

- a respondent with $i = j$ is defined as a company with relative capital-labour equivalently intensive (K_1L_1, K_2L_2, K_3L_3).
- a respondent with combinations which $i > j$ is defined as a relatively capital-intensive company (K_2L_1, K_3L_1, K_3L_2).
- a respondent with combinations which $i < j$ is defined as a relatively labour-intensive company (K_1L_2, K_1L_3, K_2L_3)

In addition:

- a respondent with the combination of $\boldsymbol{K_3L_1}$, is defined as the relatively most capital-intensive companies as the differences between i and j are the greatest.
- a respondent with the combination of $\boldsymbol{K_1L_3}$, is defined as the relatively most labour-intensive companies as the differences between i and j are the greatest.

The full descriptions of all the possible combinations and the allocation into different groups are summarised Table 2.3.

Table 2.3 Description of each Combination, and the Allocation of each Combination into the Group of either Capital or Labour-Intensive.

Combination between Annual Turnover and Labour		**GROUP**
K_3L_1	More than RMB¥ 50 million with Less than 30 employees	**Relatively Most Capital-Intensive**
K_2L_1	Between RMB¥ 10 to 50 million with Less than 30 employees	***Relatively Capital-Intensive***
K_3L_2	More than RMB¥ 50 million with Between 30 to 100 employees	
K_1L_1	Less than RMB¥ 10 million with Less than 30 employees	***Relative Capital-Labour Equivalently Intensive***
K_2L_2	Between RMB¥ 10 to 50 million with Between 30 to 100 employees	
K_3L_3	More than RMB¥ 50 million with More than 100 employees	
K_1L_2	Less than RMB¥ 10 million with Between 30 to 100 employees	***Relatively Labour-Intensive***
K_2L_3	Between RMB¥ 10 to 50 million with More than 100 employees	
K_1L_3	Less than RMB¥ 10 million with More than 100 employees	**Relatively Most Labour-Intensive**

Differences in Mean Importance Ranking by Capital or Labour-Intensive

The characteristic of capital/labour-intensive was classified into five attributes: relatively most capital intensive, relatively capital-intensive, relative capital and labour equivalently intensive, relatively labour-intensive, and relatively most labour intensive. ANOVA was used to test whether the different levels of technology (K_iL_i) will influence in mean importance ranking. Then, LSD tests were used to identify the attributes of capital and labour intensive, which are significantly different at a 5% level.

Stakeholders

The stakeholders were differentiated depending on whether they are final decision-makers or intermediate influencers. Frequency and relative percentage were used to summarise the results.

Annual Volume, Types of Wood Products, and Species Used

The annual volume used was summarised by mean (in thousand m^3), standard deviation, 95% confidence interval, maximum, and minimum by sector. In addition, the types of wood products and species used by each sector were summarised by mean (in %), standard deviation, and frequency by sector.

Distribution Channel and Final End Market

The distribution channel described in this study includes: source of supply, customers, export destinations, and final end-market. The distribution channels were summarised by frequency tables and diagrams.

2.4.4 Survey Limitations

Industrial wood consumers are not well-structured. Many companies might be involved in different businesses as part of their value chain. For example, the interior decoration sector might produce wood-based flooring, mouldings, and doors simultaneously. In addition, the furniture sector might produce dining table, chairs, and beds concurrently. Therefore, the industrial wood consumers were categorised by sector in this study rather than by a generic product within each sector.

The response rate to surveys in China is usually low because respondents are reluctant to provide information. A total number of 232 questionnaires were returned in Sun *et al.* (1999) from the Chinese furniture manufacturers. In contract, this study only received 16, 36, and 52 questionnaires respectively from the housing construction, interior decoration, and furniture sectors in southern China.

Respondents were chosen in two individual trade shows and personal visits. An assumption has been made that all the respondents are independent and unbiased.

Most respondents are from Guangdong province, southern China. Due to the geographic, cultural, and provincial regulatory differences, the results in this study may not represent all the industrial wood consumers in relation to the housing construction, interior decoration, and furniture sectors in China.

2.5 INCOME ELASTICITY (Chapter 7)

In many developed countries, the consumption of solid wood products is mainly influenced by price. Consumption of wood-based panel products usually increases in response to GDP per capita increases (Solberg, 1996). One explanation is that people use more wood-based panel products for housing construction as their GDP per capita increases (Peck, 2001). In order to test whether the consumption of a specific product will increase if the Chinese GDP increases, the income and price elasticities for each selected wood product was estimated by a constant elasticity model (*log-linear function*) which is described in Buongiorno *et al.* (2001).

2.5.1 Data Collection

In order to construct the constant elasticity model, the Chinese real GDP per capita (in RMB¥ in 1999 prices), apparent consumption per thousand capita, and (real prices) adjusted average unit import (in US$/ m^3 c.i.f) and export (in US$/ m^3 f.o.b) prices were calculated.

Real Gross Domestic Product (Real GDP per capita)

1. A series of nominal GDP (in billion RMB¥), deflator (base = 100 in 1990), real GDP per capita in 1999 prices (in RMB¥), and population (in billion) were extracted from Asian Demographics Limited (2001) in column (2), (3), (5) and (6) respectively in Table 2.4.

2. The deflator in column (3) was used to convert nominal GDP to real GDP (Table 2.4). In order to set the base year of deflator to year 1999 =100, a new series of the deflator index (base = 100 in 1999) in column (4) was calculated by dividing all the deflator index values (base = 100 in 1990) in column (3) by the base index value = 182 in 1999, and then multiplying by 100 (the base value). The deflator was also used to convert nominal average unit prices to adjusted average unit prices (Table 2.5).

3. Real GDP per capita (in 1999 prices) in Table 2.4 was calculated by dividing the real GDP (in 1999 prices) by the population in column (6).

By following these procedures, a series of real GDP per capita in RMB¥ (in 1999 prices) was constructed in Table 2.4.

Table 2.4 The Real GDP per Capita (base = 1999) in China & the Calculation Procedures.

(1) Year	(2) Nominal GDP (in billion RMB¥)	(3) Deflator index (base =100 in 1990)	(4) Deflator index (base = 100 in 1999)	(5) Real GDP in billion RMB¥ (*1999 Prices*)	(6) Population (in billion)	**(7) Real GDP per Capita in RMB¥ (*1999 Prices*)**
1987	1,196	78	43	2,809	1.09	2,570
1988	1,492	87	48	3,125	1.11	2,815
1989	1,691	95	52	3,250	1.13	2,883
1990	1,855	100	55	3,376	1.14	2,953
1991	2,162	107	59	3,687	1.16	3,184
1992	2,664	115	63	4,212	1.17	3,595
1993	3,463	132	72	4,779	1.19	4,032
1994	4,676	158	87	5,383	1.20	4,491
1995	5,848	179	98	5,949	1.21	4,912
1996	6,789	190	104	6,520	1.22	5,327
1997	7,446	191	105	7,095	1.24	5,739
1998	7,835	187	102	7,645	1.25	6,126
1999	8,191	182	100	8,191	1.26	6,506
2000	8,940		[31]101	8,878	[32]1.28	6,956

Source: Asian Demographics Limited (2001) for data from Year 1987 to 1999.

Apparent Consumption per Thousand Capita

The apparent consumption per thousand capita of each type of selected wood product was calculated by using the data from FAOSTAT online database according to ***Equation 2.5.1*** (Buongiorno *et al.*, 2001). Only eleven groups of wood products were selected because a complete series of reliable data from 1987 to 2000 could only be obtained for these wood products. The selected wood products examined were: *industrial roundwood*, *coniferous roundwood*, *non-coniferous roundwood*, *sawnwood*, *coniferous sawnwood*, *non-coniferous sawnwood*, *fibreboard*, *plywood*, *particleboard*, *veneer sheet*, and *all wood-based panels*. Definitions of these selected wood products are summarised in Appendix 2.4.

[31] Source: International Monetary Fund. 2002. International Financial Statistics Yearbook April 2002. 927 pp. Notice: The deflator in year 2000 was calculated by dividing the deflator in 2000 by the deflator in 1999 time the base value. (103/102)*100 = 101

[32] Source: China State Statistical Bureau. 2002. for the population in 2000. (http://www.stats.gov.cn/tjgb/ndtjgb/ qgndtjgb/200203310045.htm) [10 March 2002]

Equation 2.5.1 Apparent Consumption = Production + (Imports – Exports)

(Buongiorno *et al.*, 2001)

Average Price (value in US$ per cubic metre)

As described in USDA (2002), Chinese wood consumers are price conscious. The changes in consumption per thousand capita with respect to the changes in averaged unit import (US$/$m^3$ c.i.f)[33] and export prices (US$/$m^3$ f.o.b)[34] of each wood product (price elasticity) were also examined.

The import and export averaged unit prices for each wood product were extracted from FAOSTAT database and calculated by dividing the import (or export) value in (US$) by the import (or export) quantity in m^3. In order to examine the price elasticity, nominal averaged unit import and export prices were adjusted to 1999 prices by the GDP deflator (base =100 in 1999). Although GDP deflator and consumer price index (CPI) trends to be the same, CPI often overestimates inflation (Mankiw, 2000). As a result, GDP deflator was used to adjust the average unit nominal import and export prices instead of CPI. Table 2.5 shows the procedure to calculate the adjusted average import price of coniferous industrial roundwood between 1990 and 2000 in 1999 prices. The adjusted average import price in 1999 prices in column (4) was calculated by dividing column (2) by column (3) time 100 (base value = 100 in 1999).

[33] c.i.f = cost, insurance, and freight

[34] f.o.b = free on board

Table 2.5 Converting Nominal Import Price to Adjusted Import Price (in 1999 Prices) for Coniferous Industrial Roundwood.

(1) Year	(2) Nominal Import Price (US$/m3 c.i.f)	(3) Deflator Index (base = 100 in 1999)	(5) Average Import Price in 1999 Prices (US$/m3 c.i.f)
1987	.	43	.
1988	.	48	.
1989	.	52	.
1990	109	55	198
1991	103	59	176
1992	94	63	148
1993	121	72	166
1994	93	87	107
1995	110	98	111
1996	92	104	88
1997	89	105	85
1998	68	102	67
1999	62	100	62
2000	60	101	60

Source: for column (3) - International Monetary Fund, 2002.
Source: for column (2) - FAOSTAT (2001)

2.5.2 Constant Elasticity Model (*Log-Linear Model*)

An assumption has been made that the constant income elasticity model would follow the consumption function as described in ***Equation 2.5.2*** (Gujarati, 1999). By taking the natural logarithm of this equation, the consumption function is transformed into a log-linear function as shown in ***Equation 2.5.3***. The constant elasticity model in ***Equation 2.5.3*** was employed to examine how the apparent consumption of various wood products would change in relation to the change in real GDP per capita, adjusted average import price, and adjusted average export price. The coefficients $\boldsymbol{B1}_i$, $\boldsymbol{B2}_i$, and $\boldsymbol{B3}_i$ indicate the constant income elasticity, adjusted average export price elasticity, and adjusted average import price elasticity respectively.

Equation 2.5.2 $$C_{it} = A_i Y_t^{B1i} X_{it}^{B2i} M_{it}^{B3i}$$

Equation 2.5.3 $$lnC_{it} = lnA_i + \boldsymbol{B1}_i\, lnY_t + \boldsymbol{B2}_i\, lnX_{it} + \boldsymbol{B3}\, lnM_{it} + U_{it}$$

The abbreviations in ***Equation 2.5.2*** and ***Equation 2.5.3*** can be described as follows:

$\boldsymbol{B1}_i$ = the constant income elasticity of wood product *i* with respect to the real GDP per capita.

$\boldsymbol{B2}_i$ = the constant export price elasticity of wood product *i* with respect to the adjusted average export price.

$\boldsymbol{B3}_i$ = the constant import price elasticity of wood product *i* with respect to the adjusted average import price.

C_{it} = the apparent consumption per thousand capita of wood product *i*, where *t* = year 1987 to 2000.

A_i = the constant term of wood product *i*.

Y_t = the real gross domestic product (in 1999 prices) per capita in year *t*, where *t* = year 1987 to 2000.

X_{it} = the adjusted average export price of wood product *i* in year *t*, where *t* = year 1987 to 2000.

M_{it} = the adjusted average import price of wood product *i* in year *t*, where *t* = year 1987 to 2000.

U_{it} = the residual error of wood product *i* in year *t*, where *t* = year 1987 to 2000.

i = *i refers to all industrial roundwood, coniferous roundwood, non-coniferous roundwood, all sawnwood, coniferous sawnwood, non-coniferous sawnwood, fibreboard, plywood, particleboard, veneer sheet*, and *all wood-based panels.*

t = Year between 1987 and 2000, except *all industrial roundwood, coniferous roundwood, non-coniferous roundwood* used year between 1991 and 2000.

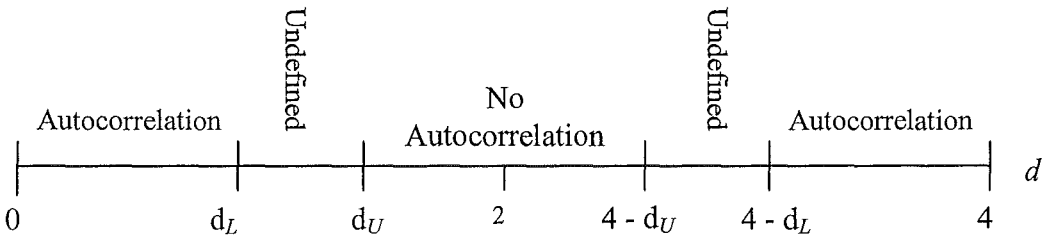
Stepwise regression was used to select the best model for each wood product. The logarithm of real GDP (lnY_t) {the explanatory variable} was forced into the model for each wood product. All other the variables were selected in the final model if the coefficients are significant at the 5% level by stepwise regression.

Autocorrelation

Durbin-Watson (**DW**) tests were used to test whether the constant elasticity models were subject to autocorrelation. The computed *d-statistic* was used to test against the critical value d_L and d_U. The critical value can be found in Gujarati (1999).

If the constant elasticity model is significantly affected by autocorrelation, its *d-statistic* will be either less than d_L or greater than $(4 - d_L)$. In contrast, if the constant elasticity model is not significantly affected by autocorrelation, its *d-statistic* will be located between $(4 - d_U)$ and d_U. Any *d*-values located either between d_U *and* d_L or $(4 - d_U)$ *and* $(4 - d_L)$ are in the undefined regions (Figure 2.3).

Figure 2.3 Durbin-Watson Test: the Autocorrelation, Undefined, and Not Significant Regions.



If autocorrelation was detected by the Durbin-Watson test, the model was transformed by the following steps which are described in Gujarati (1999). The original function in ***Equation 2.5.3*** was transformed into:

$$\ln C_{it}^* = \ln A_i^* + B1_i \ln Y_t^* + B2_i \ln X_{it}^* + B3 \ln M_{it}^* + U_{it} \quad \text{where}$$

$$\ln C_{it}^* = \ln C_{it} - p \ln C_{i(t-1)}$$

$$\ln Y_t^* = \ln Y_t - p \ln Y_{(t-1)}$$

$$\ln X_{it}^* = \ln X_{i(t)} - p \ln X_{i(t-1)}$$

$$\ln M_{it}^* = \ln M_{i(t)} - p \ln M_{i(t-1)}$$

$p = 1 - (d / 2)$ where d is the Durbin-Watson d statistic.

The first observation (e.g. *year 1987*) is lost after the transformation. As a result, models with autocorrelation have one observation less than the models without autocorrelation. Models with autocorrelation were re-run by using the transformed $\ln C_{it}^*$, $\ln Y_t^*$, $\ln X_{it}^*$, and $\ln M_{it}^*$.

Study Limitations

The real GDP per capita (in 1999 prices) in RMB¥ was used instead of using US dollar per capita because the real GDP per capita in US dollars was relatively unchanged between 1987 and 1999 as shown in Asian Demographics Limited (2001). However, living standards in China have significantly improved and the economy has rapidly expanded (Krugman & Obstfeld, 2000). One explanation is that the Chinese currency is not convertible in the international financial market, resulting in the real GDP per capita in US dollars not fully reflecting the average income level in China. As a result, the domestic currency, RMB¥, was used instead of US dollars.

Different wood product groups were used in this study compared to Buongiorno *et al.* (2001). Not all wood products have a complete series of import, export, and production between 1987 and 2000. The differences mean that only income elasticities of *fibreboard* and *particleboard* can be compared directly. Buongiorno *et al.* (2001) used "*other industrial roundwood*" instead of "*all industrial roundwood*"; "*sawnwood* plus *sleepers*" instead of "*all sawnwood*"; and "*plywood* plus *veneer sheet*" instead of "*plywood*" and "*veneer sheet*" alone. However, the comparison of the trends between the two studies should provide some indications of future wood products market trends in China.

2.6 MACROENVIRONMENTAL DRIVERS (Chapter 8)

In order to identify whether the opportunity to export New Zealand wood products to China is long-term or short-term, the economic, political, socio-demographic, technological and natural macroenvironmental drivers in relation to wood consumption were examined using a qualitative approach.

2.6.1 Economic & Political Drivers

Economic drivers refer to factors that affect buying power and patterns, for example, income per capita and income distribution (Kotler & Armstrong, 1999). Buongiorno *et al.* (2001) and Solberg (1996) suggest that GDP per capita is the most important driver which would influence the consumption in the international wood products market. Chinese GDP and the drivers of GDP growth were therefore analysed.

In order to identify the driving forces of real GDP growth, Mankiw (2000) described the growth of GDP is drive by government expenditure, private consumption expenditure, investment, and net exports. According to Scollay & St. John (2000), it can be stimulated by various macroeconomic policies such as fiscal policy, monetary policy, and exchange rate policy. These economic policies were therefore examined.

Political drivers consist of laws, agencies, and groups that influence or limit market actions. As China is still a planned market economy, the politicians' and cadres' evaluation of current economic growth and their main concerns on social issues will highly influence future policy planning. As a result, their evaluation of current economic growth and their concerns regarding social issues were examined.

Furthermore, many market analysts suggest that China's accession to the WTO in 2001 will provide a significant opportunity for overseas exporters, whilst some analysts suggest that there are also risks involved. Therefore, some of the conditions of China's WTO accession agreement were examined.

2.6.2 Socio-Demographic Drivers

Long-term wood consumption is also highly influenced by the socio-demographic environmental drivers which relate to the characteristics of human populations (Solberg, 1996). Therefore, the socio-demographic drivers described in Solberg (1996) were examined.

- population structure by age and sex;
- national population natural growth rate by region;
- population by urban and rural;
- average household size by urban and rural;
- average floor space per capita by urban and rural;
- non-permanent population (i.e. visitors, rural migrants).

2.6.3 Technological Drivers

Technological drivers will influence the efficiency, product quality, and product favourites of industrial wood consumers. Technological drivers refer to the research and development (R&D) budget and the pace of technological change (Kotler & Armstrong, 1999). In order to measure the pace of technological changes in China in relation to other countries, the Technology Achievement Index (TAI) from United Nations Development Programme (2001) was used to examine the technological changes in China.

Foreign Direct Investment

In addition, Krugman & Obstfeld (2000) state that technology can be transferred through foreign investments. In order to measure the magnitude of foreign investment in terms of technology, foreign direct investment (FDI) was examined by origin and province in China.

Recovery Rate

USDA (2002) describes the wood recovery rate in China as very high because China is labour abundant. Therefore, the percentage of wood recovery of the large and medium-sized state-owned wood processors from the China Ministry of Forestry (2000) was examined.

2.6.4 Environmental Drivers

Environmental macroenvironmental drivers will influence the domestic supply and demand of wood fibre in China. Environmental drivers refer to the availability of raw materials, pollution levels, and government (*or international organisations*) intervention in natural resource management (Kotler & Armstrong, 1999).

Because private production statistics are not included in China Ministry of Forestry statistics (2000), it is very difficult to evaluate the actual wood deficit in the Chinese wood product market. However, the National Forest Conservation Programme (NFCP) provides a set of objectives and goals. These were examined to evaluate the size and magnitude of the wood deficit.

2.7 Chapter Summary

Methodologies were developed in this chapter to address the question of whether China provides a significant export opportunity for the New Zealand forestry sector. In order to answer this question, we will begin by examining the supply-side and demand-side factors of the Chinese wood products market in Chapter 3.

Chapter 3 CHINESE WOOD PRODUCTS MARKET

In order to examine the opportunities in the Chinese wood products market for the New Zealand sector, the opportunities for the New Zealand forestry sector will be examined by reviewing the supply and demand factors. In terms of the supply-side, the wood products production and forest resources will be examined. In terms of the demand-side, the apparent consumption, the end-uses, and the demand of imported wood products will be examined.

3.1 PRODUCTION

According to the China Ministry of Forestry (2000), the total volume harvested and the production of sawn timber have declined since 1997, whilst the production of fibreboard and the number of bamboo stems harvested have gradually increased (Table 3.1).

Table 3.1 China: Total Domestic Production by Wood Product (in million m^3; except bamboo is measured in million stems).

Year	Total Volume Harvested	Sawn Timber	Plywood	Fibreboard	Particleboard	Bamboo (*million stems*)
1987	64.08	14.72	0.78	1.21	0.38	119
1988	62.18	14.68	0.83	1.48	0.48	262
1989	58.02	13.93	0.73	1.44	0.44	152
1990	55.71	12.85	0.76	1.17	0.43	187
1991	58.07	11.42	1.05	1.17	0.61	292
1992	61.74	11.19	1.56	1.44	1.16	404
1993	63.92	14.01	2.12	1.81	1.57	434
1994	66.15	12.94	2.61	1.93	1.68	504
1995	67.67	41.84	7.59	2.16	4.35	448
1996	67.10	24.42	4.90	2.06	3.38	422
1997	63.95	20.12	7.58	2.76	3.60	449
1998	59.66	17.88	4.47	2.20	2.66	693
1999	52.37	15.86	7.28	3.91	2.41	539

Source: China Ministry of Forestry (2000)

However, Table 3.1 only shows the statistics from state-owned forests and wood processors, whereas the production from private plantations and wood processors was not included. Yang (2001) describes the total harvested volume from non-state plantations contributed an additional 24 million m^3 in 1997. Moreover, USDA (2002) describes that although the official industrial roundwood production was 51 million m^3, the non-official sources indicate that total industrial roundwood production in 2001 may have reached as high as 120 million m^3. Therefore, Table 3.1 only provides limited information for this study.

3.2 RESOURCE

According to Shi *et al.* (1997), China had a total area of 960.3 million ha with 128.5 million ha of forestland in 1993, of which 94.2 million ha was native forests, and 34.3 million ha was plantation forests. Although new plantations have continuously increased since 2001 (USDA, 2002), Table 3.2 shows the area of new planting for timber extraction has gradually declined while the areas of new planting for economic and shelterbelt forests have significantly increased (China State Forestry Administration, 2000).

Table 3.2 China: The Areas of New Planting by Forest Type, 1990 – 1999 (in thousand ha).

Year	Timber Forest[35]	Economic Forest[36]	Shelterbelt Forest[37]	Fuelwood Forest[38]	Forest for Special Purpose[39]	Total
1990	3156	645	1030	340	38	5209
1991	3344	670	1244	312	26	5596
1992	3355	973	1442	235	25	6030
1993	2813	1564	1315	191	22	5905
1994	2505	2064	1253	152	19	5993
1995	1844	1970	1240	145	15	5214
1996	1711	1672	1369	150	18	4920
1997	1465	1371	1366	136	17	4355
1998	1460	1395	1772	167	17	4811
1999	1418	1404	1949	115	15	4901

Source: China State Forestry Administration (2000)

[35] "Timber forest" refers to forests aimed for timber production.
[36] "Economic forest" refers to forest aimed for fruits and nuts production.
[37] "Shelterbelt forest" refers to forest aimed for shelterbelt and environmental protection purposes.
[38] "Fuelwood forest" refers to forest aimed for fuelwood production.
[39] "Forest for special purpose" refers to forest used for experimental and conservation purposes.

3.3 CONSUMPTION

Due to the Chinese official consumption statistics not being available, the apparent consumption per thousand capita of selected wood products was examined using data from FAOSTAT because country-level data were collected through different methods. For instance, (a) tailored questionnaires sent annually to member countries, (b) magnetic tapes, diskettes, FTP transfers and accessing websites of the countries, (c) national/international publications, (d) country visits made by the FAO statisticians, and (e) reports of FAO representatives in member countries. In addition, in order to examine the wood consumption behaviour between China and other western countries, New Zealand's apparent consumption per thousand capita of selected wood products was also examined.

The apparent consumption per thousand capita of most wood products is much lower in China than in New Zealand, except in the non-coniferous categories (Table 3.3). The apparent consumption per thousand capita of non-coniferous industrial roundwood and sawnwood are much higher in China than in New Zealand. Chinese consumers consume more non-coniferous wood products than in New Zealand.

Chinese consumers' relative consumption of non-coniferous verse coniferous species has reminded virtually unchanged between the two periods. For instance, in the industrial roundwood category, the proportion of 60% coniferous versus 40% non-coniferous in the industrial roundwood category is almost the same in 1991-1995 and 1996-2000 (Table 3.3). In addition, in the sawnwood category, the ratio of 55% of coniferous versus 45% of non-coniferous in the sawnwood category is almost the same in 1991-1995 and 1996-2000 (Table 3.3).

The apparent consumption per thousand capita of sawnwood in China has declined while the apparent consumption on most wood-based panel products has increased (Table 3.3).

Hence, the Chinese consumers appear to be willing to substitute solid wood products by wood-based panel products.

Plywood is the most popular wood-based panel product in China in terms of the apparent consumption as the domestic plywood production has increased rapidly since the 1990s (Li, 1997). In contrast, fibreboard is the most popular wood-based panel product in New Zealand (Table 3.3).

In China, fibreboard has been successfully substituted in the particleboard market since 1997. Figure 3.1 shows the substitution effect of particleboard and fibreboard as they trend to move in the opposite cyclic pattern. In contrast, particleboard has never been able to replace the use of fibreboard in New Zealand (Figure 3.2).

The apparent consumption per thousand capita of all wood-based panel products in China has dramatically changed in every five-year period (Figure 3.1). It is even more obvious in the plywood market. One explanation is that the Chinese Central Government reviews its five-year plan every five years (1991 to 1995, and 1996 to 2000). One of the objectives of the five-year plan between 1996 and 2000 was to improve the living standards of rural and urban residents. As a result, the demand for wood products for housing and civil infrastructure in these five years increased substantially over the previous five years.

In China, the apparent consumption per thousand capita of industrial roundwood and sawnwood is shown in Figure 3.3. The apparent consumption per thousand has remained steady while for sawnwood has been declining since 1996.

In New Zealand, the apparent consumption per capita of industrial roundwood and sawnwood has both remained steady since the early 1990s (Figure 3.4).

Table 3.3 The Annual Apparent Consumption (m^3 per thousand capita) by Wood Products in China and New Zealand.[40]

The Apparent Consumption of Wood Products (m3/000's capita)	CHINA			NEW ZEALAND		
	5-Year Average			*5-Year Average*		
	1991-1995	1996-2000	Change (%)	1991-1995	1996-2000	Change (%)
Industrial roundwood	**85.4**	**89.6**	**5%**	**3142.4**	**2992.6**	**-5%**
Industrial roundwood {*coniferous*}	52.9	55.3	4%	3140.2	2983.1	-5%
Industrial roundwood {*non-coniferous*}	32.5	34.3	6%	2.1	9.4	344%
All Sawnwood	**21.1**	**18.2**	**-14%**	**436.6**	**564.0**	**29%**
Sawnwood {*coniferous*}	12.1	10.1	-17%	482.8	558.1	16%
Sawnwood {*non-coniferous*}	9.0	8.1	-10%	13.8	5.9	-57%
Fibreboard	**1.8**	**3.5**	**97%**	**62.9**	**59.3**	**-6%**
MDF*	0.8	1.3	59%	5.2	7.3	39%
Plywood	**5.2**	**7.2**	**37%**	**10.9**	**26.0**	**139%**
Particle board	**1.8**	**2.7**	**52%**	**20.9**	**25.0**	**19%**
Veneer sheet	**0.4**	**0.6**	**58%**	**13.5**	**73.2**	**444%**
All Wood-based panel products	**9.1**	**13.9**	**53%**	**108.1**	**183.5**	**70%**
Sawlogs & Veneer logs#	**42.2**	**46.0**	**9%**	**2871.5**	**2045.1**	**-29%**
Sawlogs & veneer logs# {*coniferous*}	26.7	29.5	10%	2849.4	2043.0	-28%
Sawlogs & veneer logs# {*non-coniferous*}	15.5	16.5	7%	22.1	2.0	-91%

Source: FAOSTAT (2001)[41]

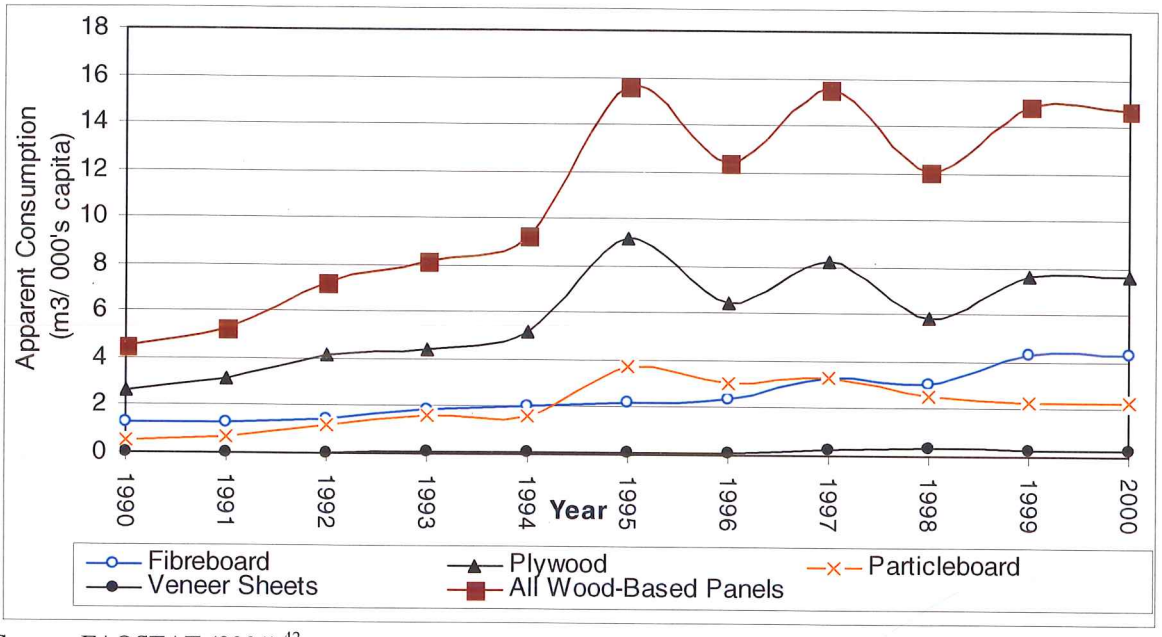
* FAO data start from year 1995, 5-year average for period 1991-1995 is not given. Data presented are the 1995 figures only.

FAO export data stop in 1990. Consumption per thousand is based on production data only.

[40] Apparent Consumption = Production + Import – Export

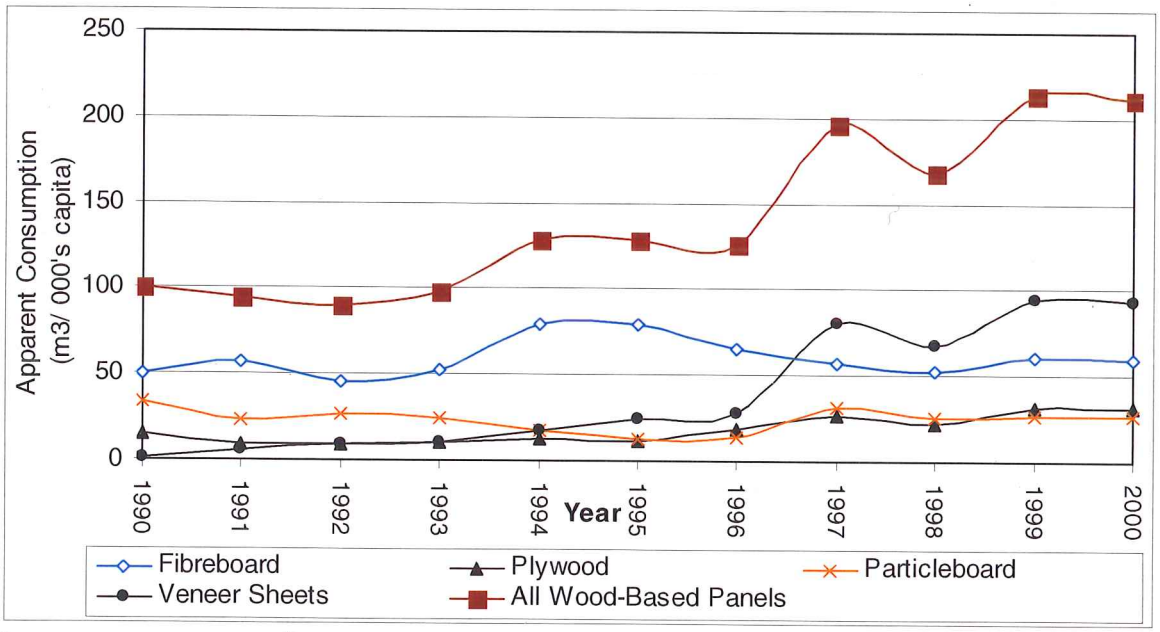
[41] Source: FAO (2001). Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/ collections?subset=forestry) [15 November 2001]

Figure 3.1 China's Apparent Consumption (m^3/ thousand capita) **by Wood Products, 1990 - 2000.**



Source: FAOSTAT (2001) [42]

Figure 3.2 New Zealand's Apparent Consumption (m^3/ thousand capita) **by Wood Products, 1990 – 2000.**

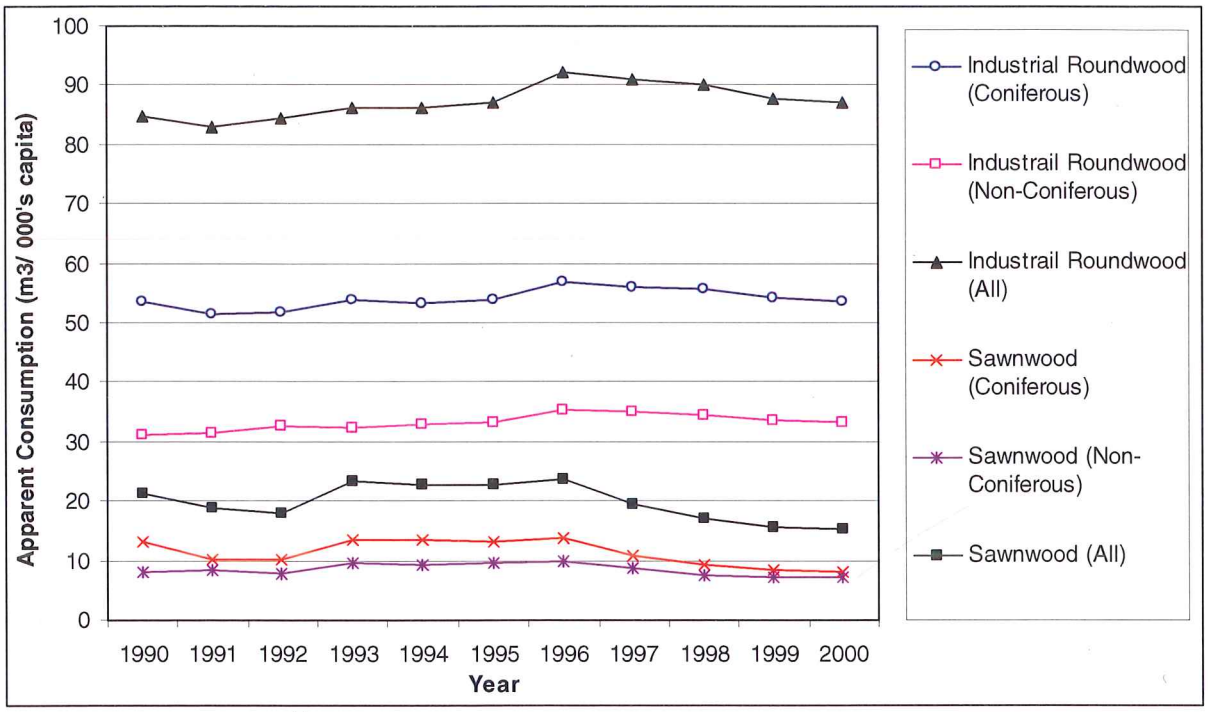


Source: FAOSTAT (2001)[43]

[42] Source: FAO (2001). Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/ collections?subset=forestry) [15 November 2001]

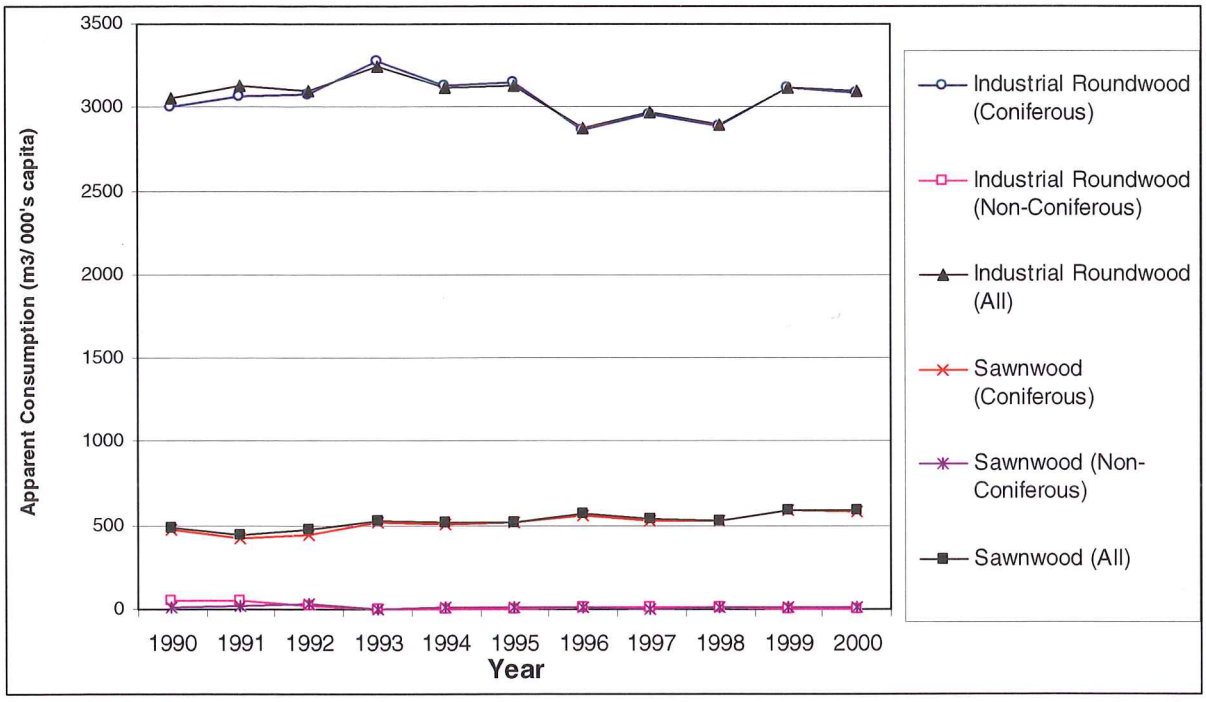
[43] Source: FAO (2001). Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/ collections?subset=forestry) [15 November 2001]

Figure 3.3 China's Apparent Consumption (m^3/ thousand capita) **of Industrial Roundwood and Sawnwood, 1990 – 2000.**



Source: FAOSTAT (2001) [44]

Figure 3.4 New Zealand's Apparent Consumption (m^3/ thousand capita) **of Industrial Roundwood and Sawnwood, 1990 – 2000.**



Source: FAOSTAT (2001) [45]

[44] Source: FAO (2001). Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/ collections?subset=forestry) [15 November 2001]

[45] Source: FAO (2001). Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/ collections?subset=forestry) [15 November 2001]

3.4 CONSUMPTION BY END-USE

China has a deficit of industrial roundwood of between 33 and 43 million m^3 (USDA, 2001b). According to Sun *et al.* (1999), industrial wood consumers are the most important importers of wood products. Understanding the wood uses of the industrial wood consumers would be useful for marketing New Zealand's wood products in the Chinese wood products market.

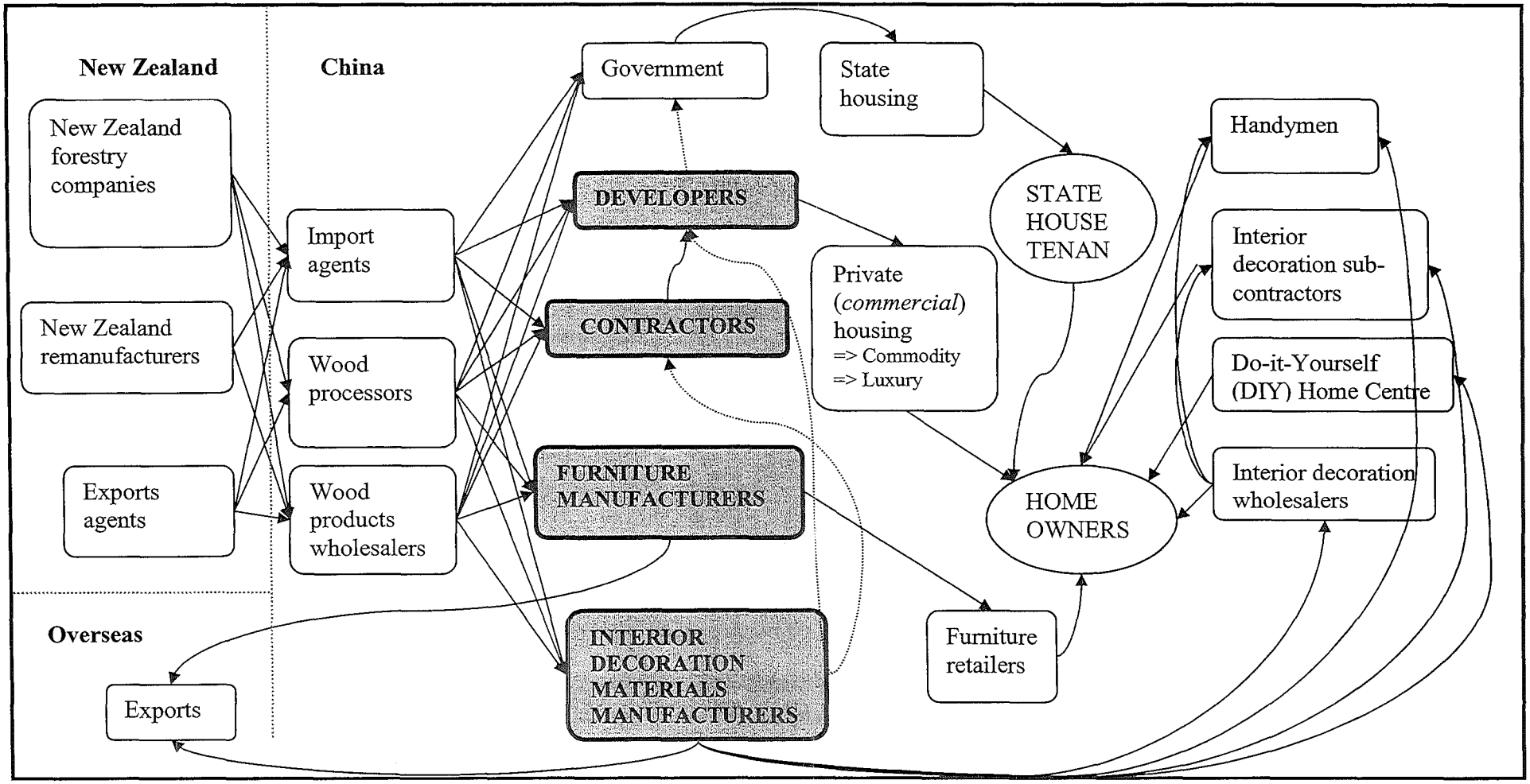
The construction, interior decoration, and furniture sector are the most important wood consumers in the Chinese wood products market as described in USDA (2002); USDA (2001b); Yang (2001); Sun & Hammett (1999); and Li (1997). The residential market is recognised as the market with the greatest potential market to expand as the Ministry of Construction (MOC) in China plans to increase the average living space from 20 m^2 in 2001 to 22 m^2 by 2005 (USDA, 2002). In addition, individual households must have basic function (*windows, doors, plumbing, and electricity fixtures*) installed (USDA, 2001b). Furthermore, the total number of housing starts (*including all types of residential housings*) reached 22 million units in 2001, and it is forecast to increase at an average of 8.9 % per annum between 2002 and 2003 (USDA, 2002). Therefore, the Chinese residential market seems to have the greatest opportunity in compared to the commercial and industrial sectors.

The Chinese industrial wood consumers in the residential housing, interior decoration, and furniture sectors are summarised in Figure 3.5. There are several distinctive figures in Figure 3.1:

- According to China State Statistical Bureau (2000), around 65 to 70% of the new completed floor space was under private ownership in 1999.
- Previously, the majority of housing was allocated by the government and employers. Since the housing reform in 1998, tenants can purchase their existing houses and become homeowners (Freese, 2001).
- Wood framed housing has only accounted for a small proportion of the total housing starts in China. On average, it accounts for 0.6% of the total housing starts in 2001 (USDA, 2002).
- Developers are generally selling the concrete shells with some basic utilities (windows, doors, plumbing, and electricity fixtures) to the homebuyers whereas homeowners are responsible for most of the interior (Freese, 2001).
- Many Chinese are not DIY (*do-it-yourself*) trained as in many western countries (Longo & Gonzalea, 2000).
- Most developers are sub-contracting their construction projects from housing construction contractors.

Freese (2001) and Market Research Centre (2001) describe that the Chinese housing construction, interior decoration, and furniture sectors are substantially different to those in many western countries. It is necessary to have a better understanding of these sectors in China in order to examine what and how wood products are used in these sectors.

Figure 3.5 The Residential Housing Construction, Interior Decoration, and Furniture Sectors in China.



Sources: Compiled from Freese, 2000; Hammett & Sun, 1997; Li, 1997; Market Research Centre, 2001; Sun & Hammett, 1999; USDA, 2001a; USDA, 2001b; and USDA, 2000.

3.4.1 Housing Construction Sector

Wood Processors

The majority of wood products are used for temporary formwork, scaffolding boards, windows, doors, and partitions on site in urban areas; in rural areas, wood products are used for beams, rafters, joists (USDA, 2001b). Plywood, sawn timber, fibreboard, and particleboard are the major wood products used in temporary construction (Li, 1997). Previously, hardwood panel products and coniferous sawn timber were used for temporary construction. Hardwood logs and panel products such as plywood from Malaysia, Indonesia, Vietnam, Cambodia, and domestic suppliers were the major hardwood suppliers to the industrial wood consumers in the construction sector (USDA, 2001b). Hardwood panels were banned for temporary construction from 2002 due to environmental issues.[46]

Developers & Construction Contractors

According to USDA (2002), new housing starts in China have increased by 27% from 2000 and reached 359 million m^2 in 2001. In addition, a total of 22 million housing units started in 2001, of which, only 0.06% was wood framed housing units, the majority of the housing units were built using steel, concrete, and other materials. Although wood framed housing projects have been developed by several North American companies in Shenzhen, Shanghai, Beijing, and Guangzhou (Softwood Export Council, 2000), the number of wood framed houses in China is still relatively small.

There were more than 23,000 developers in China, of which; 43% were state-owned; 24% owned by the collective owners; 21% were owned by foreign investors from Hong Kong, Taiwan, and Macau, and 12% by others (Wang & Murie, 1999).

[46] Tsang, P. Director, Hawaii Engineering Limited. Hong Kong. Personal communication. 10 February, 2002. Face-to-face interview.

Most wood products are used for temporary construction. On average, wood products for concrete formworks can only be re-used 7 to 8 times.[47] Although, pre-cast concrete board for housing construction tends to reduce the use of wood products, in practice, high-density residential areas with narrow streets are a limiting factor for using pre- cast concrete boards.[48]

Building Codes

According to the presentation by Fang (2000),[49] regulatory constraint is one of the major factors which limits the development of wood framed housing units in China. Currently, the Chinese Ministry of Construction is using building Codes for wood framed housings: GBJ5 (Timber Design Code); GBJ20 (Timber Inspection Code); and GBJ16 (Fire Safety Code). The current construction and fire codes from the Chinese Ministry of Construction for wood framed housing are based on traditional Chinese farmhouse-style construction; the codes do not incorporate other modern materials and building methods that are being used in developed countries. For example, the Fire Safety Code in China has limited wood frame housing which can only be built up to a maximum of 2 storeys with a minimum spatial distance of 12 m apart, floor space is also limited to a maximum of 600 m^2 per floor. Under these restrictions, attached wood frame houses and multi-storey apartments cannot be built.

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[47] Tsang, P. Director, Hawaii Engineering Limited. Hong Kong. Personal communication. 10 February, 2002. Face-to-face interview.

[48] Tsang, P. Director, Hawaii Engineering Limited. Hong Kong. Personal communication. 10 February, 2002. Face-to-face interview.

[49] Fang, X. 2001. Wood Frame Construction and the Building Code. Presentation from CINTRAFOR – 18th Annual International Forest Products Markets and Asian Housing Conference on 26 September 2001. (http://www.cintrafor.org/CONFERENCE_TAB/2001_CONF_AGENDA.HTM) [5 October 2001]

Recently, the Timber Design Code and the Fire Safety Code were reviewed by a North American Code committee. The code committee has discussed redrafting these codes with the Chinese Ministry of Construction. Members in the committee included: AF&PA (America Forest and Pulp Association), AWC (American Wood Council), APA (APA - the Engineered Wood Association), Weyco, WWPA (Western Wood Products Association), COFI (Council of Forest Industries), CanPly, Forintek, CWC (Canadian Wood Council), and design companies and universities from China and North America. Thus, it is expected that the revised building codes will move slightly toward the current North American building standard.

Housing Market

Chinese dream homes are quite different from what New Zealanders would idealise. Most Chinese homebuyers are buying a basic concrete structure with basic utilities (windows, doors, plumbing and electricity fixtures). Homeowners are responsible for finishing the rest of the interior decoration either by themselves, using handymen, or specialised sub-contractors (Freese, 2000). They usually pay an additional 30% to 40% of their house price for interior decoration before they move into their new units (USDA, 2001).

According to Market Research Centre (2001), the Chinese housing market can be divided into three categories: the benefit (state houses), commodity (private houses), and luxury (private) housing markets. The benefit housing is the state housing which provides for the low income households whereas commodity housing (*commercial housing*) is privately owned by homeowners. The average cost for these two types of housing ranges from US$ 270 to 300 per m^2 (Market Research Centre, 2001). In contrast, the average cost of the luxury housing market ranges from US$ 301 to 1000 per m^2 (Market Research Centre, 2001).

- ***Benefit Housing***

Benefit housing is usually allocated and rented to state workers. Workers at the higher level of the enterprises and institutions may buy these houses at a discounted market price. On average, tenants are paying about US$ 24 per month for a two bedroom unit. Surging house prices and low salaries are the main reasons restricting individual from owing their houses (Wang & Murie, 1999).

- ***Private Housing (or Commercial Housing)***

The national average private housing price in 2000 was about US$ 253 per m^2 of living area with the average apartment size around 50 m^2 (Freese, 2001). An average unfinished apartment (only with windows, doors, plumbing and electricity fixtures) sells for US$ 12,650. However, apartment prices in the coastal cities run much higher with a two bedroom unit selling for as much as US$ 36,145 to 48,193 in Shanghai and Beijing (Freese, 2001). The average prices of commercial housing units sold in different cities between 1998 and 1999 are shown in Appendix 3.1.

- ***Luxury Housing Market (low density and wood framed housing)***

The luxury housing market accounted for less than 1% of the entire housing market (Market Research Centre, 2001). Most of the homebuyers in the luxury market are the middle and upper-classes and Chinese expatriates. North American developers are building wood framed housing and targeting foreign business, Chinese expatriates, and upper-class domestic Chinese homebuyers. Some North America developers have formed a joint venture with Hong Kong and Taiwan developers to target the ordinary Chinese domestic and expatriate markets (Softwood Export Council, 2000).

Wood framed housing units built by developers often do not obtain any selling permits from the government authority due to the restrictions from the current building codes & ordinance.

The only thing that developers can do is to rent these wood frame housing units to the foreign business and expatriate markets.[50]

3.4.2 Interior Decoration Sector

USDA (2002) reported that Chinese consumers spent a total of US$ 43.3 billion in 2001 (including labour and materials), of which US $36 billion was spent on interior decorating materials, with 25% of this spent on wood products. Hence, the wood products market for interior decoration purposes was estimated to be worth US$ 9 billion in 2001. The volume used by the interior decoration sector was estimated to 10 million m^3 of industrial roundwood in 2001 (Freese, 2001).

Interior Decoration Material Manufacturers

According to USDA (2002), wood flooring followed by mouldings are the main products manufactured by the interior decoration sector in China. In 2001, the 30 largest manufacturers produced a total of over 60 million m^2 of wood flooring. Wood flooring is generally divided into three groups: 1). solid wood flooring; 2) composite laminated wood flooring; and 3) laminated bamboo flooring. In addition, composite laminated wood flooring can be sub-divided into two categories: **i).** laminated flooring using MDF (medium-density fibreboard) or HDF (high-density fibreboard) as a base; and **ii).** laminated flooring using particleboard as a base.

Chinese manufacturers import a substantial amount of non-coniferous (hardwood) wood products for the domestic market. Most imported hardwoods are used for veneer, flooring, and moulding for the domestic market as well as for re-exporting as finished goods to the

[50] Fang, X. 2001. Wood Frame Construction and the Building Code. Presentation from CINTRAFOR – 18th Annual International Forest Products Markets and Asian Housing Conference on 26 September 2001. (http://www.cintrafor.org/CONFERENCE_TAB/2001_CONF_AGENDA.HTM) [5 October 2001]

United States, Japan, and other countries. High quality hardwood that is imported from Europe and the United States could be marketed at a good price, especially wood that is kiln-dried and shipped in containers, such as White Branch Oak, Cherry, Beech, and Maple. Reported selling prices are from around US$ 1,000 to 2,500 per m^3.[51]

Developers & Interior Decoration Sub-contractors

As mentioned before, most developers in China were reluctant to provide any interior decorated units to homebuyers because developers would have to bear the extra risk of a lack of buyers as homebuyers are seeking individuality (USDA, 2001). However, recently, a proportion of developers have started to provide decorated housing units to homebuyers as a convenience service for them to save time, efforts, and money for decorating their homes (USDA, 2002). Most developers are subcontracting these interior decoration jobs to interior decoration sub-contractors as sub-contractors usually do a better job than developers.[52]

Wholesale & Retail Markets

DIY home centres are mostly concentrated in Shanghai and Beijing. In Guangdong (southern China), wholesalers and retailers are individually clustered in a number of streets and areas (Longo & Gonzalea, 2000).

Homeowners

Individual homeowners usually find their own sub-contractors or handymen on the market, and tell them what they want them to do instead of asking for recommendations (Freese, 2001). Besides, many Chinese are not "DIY" trained as in the western countries as traditional attitudes tend to hold that people who can afford to pay an installer should not do home

[51] Source: FarmChina. 2000. (http://eng.farmchina.com/forestry/mrdetail.asp?id=839) [27 November 2000]
[52] Tsang, P. Director, Hawaii Engineering Limited. Hong Kong. Personal communication. 10 February, 2002. Face-to-face interview.

improvement jobs themselves. These attitudes are especially obvious among the middle class and professional people. As a result, most homeowners rely on contractors or handymen to do the jobs (Longo & Gonzalea, 2000). The average decoration cost (labour and materials inclusive) for residents in cities and town is around US$ 24 per m^2.[53]

3.4.3 Furniture Sector

China's furniture sector accounted for 13% of the total industrial timber consumption in 1997 (Yang, 2001). Li (1997) projected that it would consume 47% of the total plywood, fibreboard, and particleboard production by 2000. The total output of the Chinese furniture sector increased 17% between 2000 and 2001, and reached RMB 140 billion Yuan in 2001 (USDA, 2002). Particleboard, MDF, plywood, hardwood sawn timber/dimension, veneers, and unprocessed logs are the major wood products used by the furniture manufacturers (Sun *et al.*, 1999).

Furniture Manufacturers

According to USDA (2001a), there are more than 50,000 furniture manufacturers of various sizes with total output of US$ 14.5 billion in China, and these manufacturers employ over five million people. The furniture sector is dominated by foreign joint ventures and privately owned companies. The furniture industry is centred primarily in the southern province of Guangdong, which accounts for more than half of domestic production (USDA, 2001a). Other furniture manufacturers from Singapore, South Korea, and Southeast Asian countries have established their production bases in the cities of Shanghai, Dalian, and nearby provinces such as Shandong and Zhejing.

[53] Source: Gu Yaohua, Vice Standing Chairman of the board of directors of China's Building Materials Industrial and Economic Institute at the Advanced Seminar on China's Building Materials Industrial and Economic Situation. (http://eng.farmchina.com/forestry/mrdetail.asp?id=2002) [5 July 2001]

Particleboard, hardwood sawn timber (and dimension), and MDF were the top three wood-based materials used by the furniture producers (Sun *et al.*, 1999). Manufacturers in northern China preferred solid wood than wood-based panels as northern regions are closer to the domestic and Russia timber resources (Sun *et al.*, 1999).

Furniture Buyers

According to the statistics from the China National Furniture Association (CNFA), described in China Daily (1999)[54], the national annual expenditure on furniture was expected to reach US$ 12 billion which is about US$ 12 per capita per annum. The average family size in China is around 3.58 capita per household (China State Statistical Bureau, 2000), thus each family will be expected to spend about US$ 43 per annum.

There are over 60 species of high quality natural veneers imported from the countries of Europe and America. The main species prevailing in the Chinese market are white beech, maple, red oak, white oak, cherry, sapeli, walnut, poplar burl, and madrona burl. Imports from Asian countries are: pears, teak, mahogany, Burma coast padauk (*Pterocarpus indicus*), naked phoebe (*Phoebe tavoyana*). Red and white oak veneer is popular in the Chinese markets and used mainly for laminated veneer of assembled wardrobes, TV cabinets, dining tables, decorative doors, laminated flooring, and decorative boards. Furniture made of cherry veneer gives people a solemn and elegant feel. The black walnut veneers are mainly used for bosses' desks and music boxes. The high-grade decorative products show a symbol of luxury and elite.[55]

[54] China Daily. 25 April 1999. (http://www1.chinadaily.com.cn/en/home/index.html) [10 July 2001]
[55] Source: FarmChina (http://eng.farmchina.com/forestry/mrdetail.asp?id=784) [3 August 2001]

Foreign Retailers

In the domestic furniture retail market, the furniture giant, IKEA has proven remarkably successful in the Chinese market. IKEA's annual sales in China rose by 4% in 2001 (USDA, 2002). Key to its continued success is efforts to keep prices down. Currently, 25% of IKEA furniture sold in China is locally made, and IKEA plans to increase this ratio to 50% in the near future (USDA, 2002). As IKEA is one of the retail chains in China, it has announced that its solid wood products must not be taken from intact natural forests or other forests with a high conservation value, unless the forests have been certified according to the Forest Stewardship Council's (FSC) principles and criteria or equivalent,[56]

3.5 IMPORTS

China imported approximately US $3.6 billion worth of wood products from all sources in 2001 for the year ended July (Appendix 3.2),[57] more than double the value imported in the year ended July 1997.

Unprocessed roundwood was the most important wood product category imported into China by value.[58] It accounted for 46% of the total import value for the year ended July 2001. Its value has tripled, and the import volume has risen four times since 1997 for the year ended July 2001 (Appendix 3.3).

Sawn timber was the second most important wood product imported by value.[59] It accounted for 27% of the total import value for the year ended in 2001. Import value for sawn timber has risen four times (Appendix 3.2) while import volume has tripled since 1997 for the year ended July (Appendix 3.3).

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[56] Source: IKEA. (http://www.ikea.com./about_ikea/code_of_conduct/forestry.asp) [20 November 2002]
[57] "Wood Products" refers to HS 44.
[58] "Unprocessed Roundwood (or Logs)" refers to HS 4403.
[59] "Sawn Timber" refers to HS 4407.

Plywood was the third most important wood-based product imported by value after unprocessed roundwood and sawn timber,[60] followed by fibreboard,[61] and veneer sheet.[62] The import value and volume for most of the wood-based panel products have increased since 1997, except plywood which has shown a significant decline in terms of volume and value since 1998. In contrast, the import value and volume of fibreboard and particleboard in 2001 were tripled.[63]

Import Value by Country

New Zealand ranked as the eleventh largest wood products supplier by value in China in 2001, with Indonesia, Malaysia, Russia, Germany, and Gabon being the top five wood products suppliers (Table 3.4). Surprisingly, South Korea, which is one of New Zealand's major export destinations since the mid 1990s, is also one of the major wood product suppliers to China in terms of total import value (Table 3.4).

New Zealand wood products accounted for only 2.3% of the total import value from all sources in 2001 (year ended May). It rose from 1.2% in 1996 to 2.3% 2001 (year ended May). In contrast, the proportion of wood products by value from Russia, a major competitor with New Zealand wood products, rose from 2.6% to 11.8% during the same period (Table 3.4).

In order to understand how New Zealand's wood products are performing in the Chinese wood products market, the rest of this section will focus on the major wood products: unprocessed logs, sawn timber, fibreboard, particleboard, plywood, and veneer sheet.

[60] "Plywood" refers to HS 4412
[61] "Fibreboard" refers to HS 4411.
[62] "Veneer Sheet" refers to HS 4408.
[63] "Particleboard" refers to HS 4410.

Table 3.4 China: Imports of Wood Products[64] by Value (c.i.f million US$) **and country, 1996-2001** (year ended June).

Rank (2001)	Country	1996	1997	1998	1999	2000	2001
	--World--	1,600	1,638	2,058	2,233	3,347	3,715
1	Indonesia	469	348	482	498	618	768
2	Malaysia	479	496	499	564	679	553
3	Russia	41	70	115	178	335	440
4	Germany	5	13	47	152	340	339
5	Gabon	97	158	226	97	216	240
6	United States	72	104	144	129	152	144
7	Thailand	16	20	26	43	71	111
8	Papua New Guinea	32	20	33	33	86	109
9	Myanmar	81	28	22	36	57	97
10	France	1	3	11	32	69	88
11	**New Zealand**	**20**	**18**	**25**	**42**	**72**	**85**
12	Equatorial Guinea	14	25	51	30	76	77
13	South Korea	68	58	48	48	71	65
14	Liberia	-	-	-	-	8	51
15	Canada	24	28	15	20	25	50
16	Cambodia	4	14	48	38	50	49
17	Romania	-	0	0	4	24	42
18	Brazil	1	2	4	7	20	41
19	Italy	5	4	6	13	41	37
20	Australia	8	11	15	15	30	36
21	Other	161	220	239	256	306	294
% New Zealand		1.2%	1.1%	1.2%	1.9%	2.2%	2.3%
% Russia		2.6%	4.3%	5.6%	8.0%	10.0%	11.8%

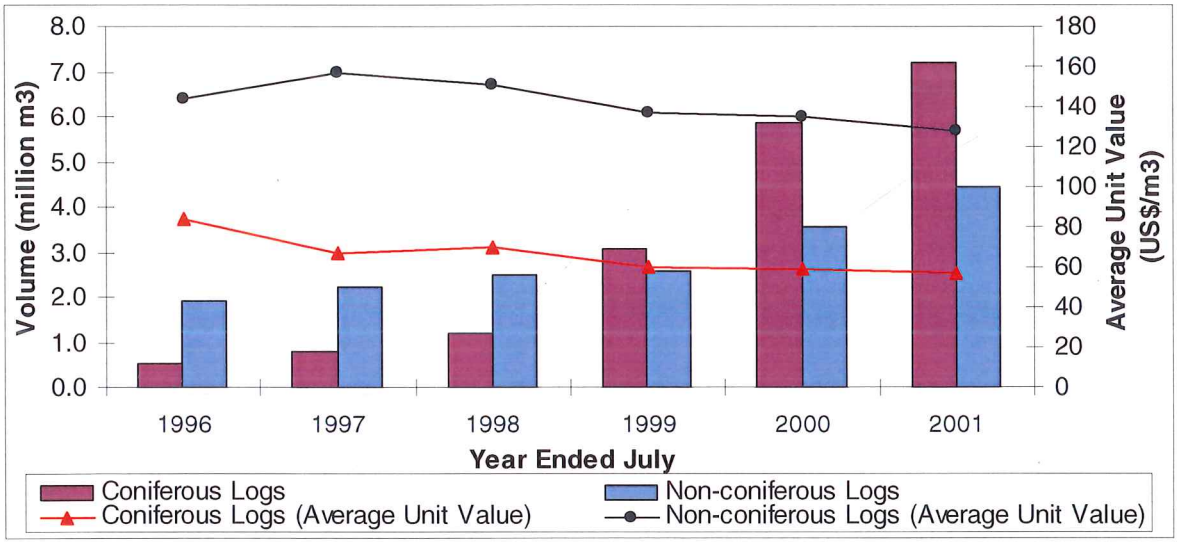
Source: World Trade Atlas: China Customs.

[64] "Wood products" refers to HS 44.

3.5.1 Unprocessed Roundwood (Logs) [65]

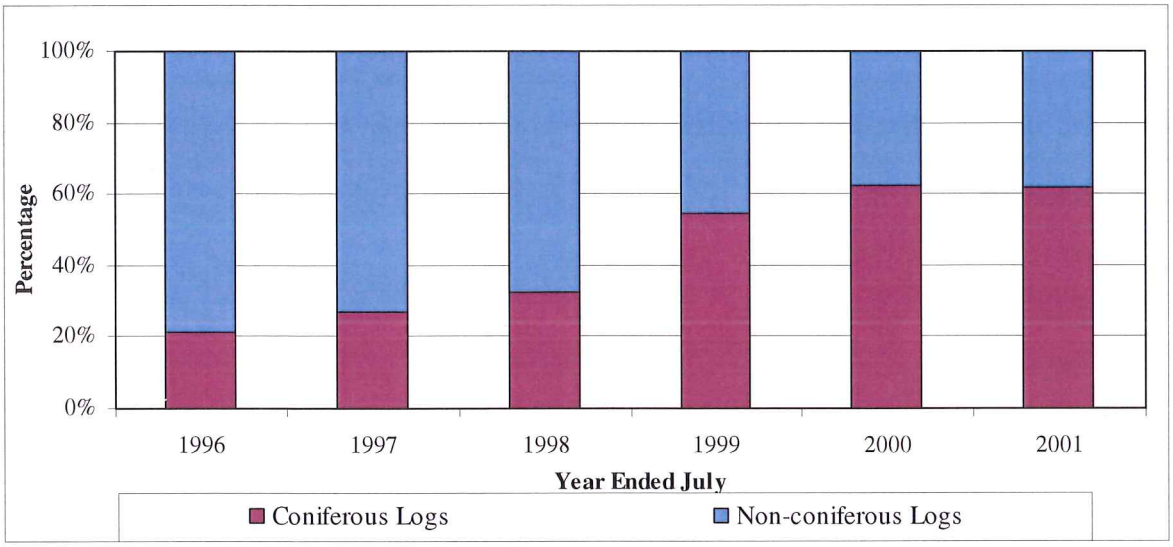
Before 1999, China imported more non-coniferous than coniferous roundwood by volume. A major import trend has been the dramatic increase in imports of coniferous roundwood since the implementation of the logging ban in July 1998 (Figure 3.6).

Figure 3.6 China: Imports of Unprocessed Roundwood by Volume (million m^3) **and Average Unit Value** (c.i.f US$/$m^3$), **1996-2001.**



Source: World Trade Atlas: China Customs

Figure 3.7 China: Imports of Coniferous and Non-Coniferous Roundwood, 1996-2001, by % Volume.



Source: World Trade Atlas: China Customs

[65] Coniferous Roundwood refers to HS 440320, and non-coniferous roundwood refers to HS 440399

Whilst the volume of non-coniferous and coniferous roundwood imported during the period has increased, the proportion of coniferous roundwood imported has increased at a faster rate (Figure 3.7), which is mainly due to the announcement of logging ban in China in 1998. By 2000, the proportion of coniferous roundwood was 60% of the total volume.

Although import volumes have increased in China, the average nominal unit value for non-coniferous and coniferous unprocessed roundwood has shown a downward trend since 1998 (Table 3.5). One explanation is that competition from Russia has created a huge impact in the Chinese market, and competition in China has lowered the average import price of coniferous roundwood in China. Another explanation is that most currencies have depreciated against the strong U.S. dollar over the past several years, except currencies that are pegged with the U.S. dollar such as the Chinese RMB¥ and Malaysia Ringgit (Figure 3. 8). The Chinese currency has remained at RMB¥ 8.38 per US Dollar while the exchange rates of the main wood products suppliers (Russia, Indonesia, New Zealand, Australia, and Canada) has depreciated against the US dollar, which results in lowered average import price in terms of US dollars.

On average, the volumes of coniferous and non-coniferous roundwood imported have gradually increased by 70% and 18% per annum respectively whereas the average unit price of coniferous and non-coniferous roundwood have decreased about 7% and 2% per annum respectively since 1996 (Table 3.5).

Furthermore, there is a price differential between markets for coniferous and non-coniferous roundwood in China, the average differential being between US $70 to $80 per m^3 between 1998 and 2001 (Table 3.5). This is due to coniferous roundwood mainly targeting the wood

processors for wood-based panel production, and non-coniferous roundwood are mainly targeting the furniture and flooring manufacturers for decorative purposes.

Table 3.5 China: Imports of Unprocessed Coniferous and Non-coniferous Roundwood by Volume (million m^3) and Average Unit Price (c.i.f. US$ /m^3), 1996 – 2001. [66]

Year Ended July	1996	1997	1998	1999	2000	2001
Volume of Coniferous Roundwood (million m3)	0.51	0.81	1.20	3.07	5.85	7.19
Percentage change (%)		58%	48%	155%	91%	23%
Volume of Non-coniferous Roundwood (million m3)	1.92	2.22	2.47	2.58	3.56	4.46
Percentage change (%)		16%	11%	5%	38%	25%
Coniferous Roundwood (Average Unit Price in US$/m3)	84	67	70	60	59	57
Percentage change (%)		-20%	4%	-13%	-2%	-3%
Non-coniferous Roundwood (Average Price in US$/m3)	144	157	151	137	135	128
Percentage change (%)		9%	-4%	-9%	-2%	-5%
Difference in Average Unit Price between Non-coniferous and Coniferous Logs						
(Average Unit Price in US$/m3)	60	90	81	76	75	70

Source: World Trade Atlas: China Customs

Unprocessed Coniferous Roundwood Market

Prior to 1999, Russia, North Korea and Malaysia were the top three countries exporting unprocessed coniferous roundwood to China (Table 3.6). In 2001, Russia had 89% of the market in terms of volume, followed by New Zealand (6%), and Malaysia (1%). New Zealand has rapidly increased its market share, and it ranked as the second most important coniferous roundwood supplier in terms of volume.

The average unit price of New Zealand's coniferous roundwood decreased by 12% between 1999 and 2001. It decreased from US $74 to $66 per m^3 while the average unit prices of other suppliers remained relatively unchanged. This suggests that Chinese wood processors

[66] Coniferous Roundwood refers to HS 440320, and non-coniferous roundwood refers to HS 440399

imported roundwood mainly with poorer average quality and lowered the nominal average unit price.

Table 3.6 China: Imports of Unprocessed Coniferous Roundwood[67] by Quantity (thousand m^3), Average Unit Price (c.i.f US$/$m^3$), and Country, 1999-2001 (year ended July).

	Quantity (thousand m3)			Avearage Price (US$/m3)			Market Share by Volume		
COUNTRY	1999	2000	2001	1999	2000	2001	1999	2000	2001
Russia	2,573	4,976	6,413	$ 58	$ 57	$ 56	84%	85%	89%
New Zealand	126	359	428	$ 74	$ 69	$ 66	4%	6%	6%
Malaysia	118	296	107	$ 73	$ 87	$ 84	4%	5%	1%
Korea, North	172	151	89	$ 50	$ 49	$ 48	6%	3%	1%
United States	45	9	59	$ 126	$ 134	$ 121	1%	0%	1%
Australia	0	11	7	$ -	$ 54	$ 53	0%	0%	0%
Canada	1	2	2	$ 115	$ 238	$ 162	0%	0%	0%
Other	30	45	88	-	-	-	1%	1%	1%
Total	3,066	5,848	7,194	$ 60	$ 59	$ 57	100%	100%	100%

Source: World Trade Atlas: China Customs.

Exchange Rate

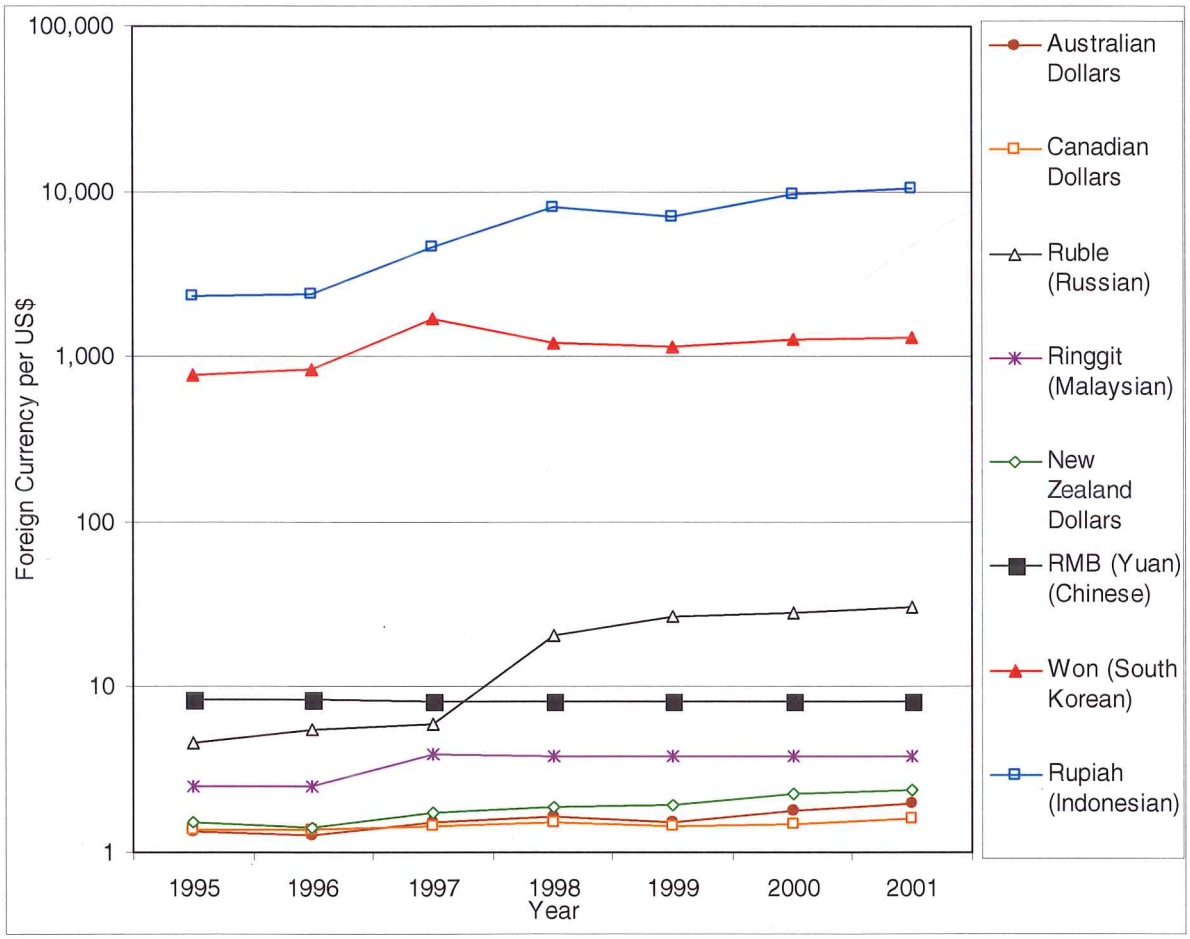
The differences in average price between Russia and New Zealand have narrowed since 1999 (Table 3.6). New Zealand has the advantage in terms of price against most of the suppliers in the coniferous roundwood market, apart from Australia and North Korea. The price advantage for New Zealand is probably due to the depreciated New Zealand dollar against the U.S. dollar (Figure 3. 8). The New Zealand dollar devaluated by 32% against the U.S. dollar between 1997 and 2001[68] allowing the New Zealand forestry sector to become more competitive in the Chinese wood products market in terms of price (Figure 3.7). In addition, the Russian Ruble, depreciated by nearly 240% between 1997 and 1998 (Figure 3. 8), which provides a substantial price advantage for the Russian wood products after the depreciation.

[67] Coniferous roundwood refers to HS 440320.

[68] Source: Reserve Bank of New Zealand. (http://www/rbnz/govt/nz) [30 November 2001]. Based on average monthly exchange rate: NZ$ 1 = US$ 0.66 in July 1997 & NZ$ 1 = US$ 1 = US$ 0.45 in July 2001.

The exchange rate has highly influenced the coniferous roundwood market in China. The Chinese currency RMB (Renminbi), unit ¥, is only convertible in the international market with the US dollar at an official exchange rate of US$ 1 to RMB¥ 8.3 since 1996 (International Monetary Fund, 2002).

Figure 3. 8 Foreign Currencies per US$, 1995 – 2001.



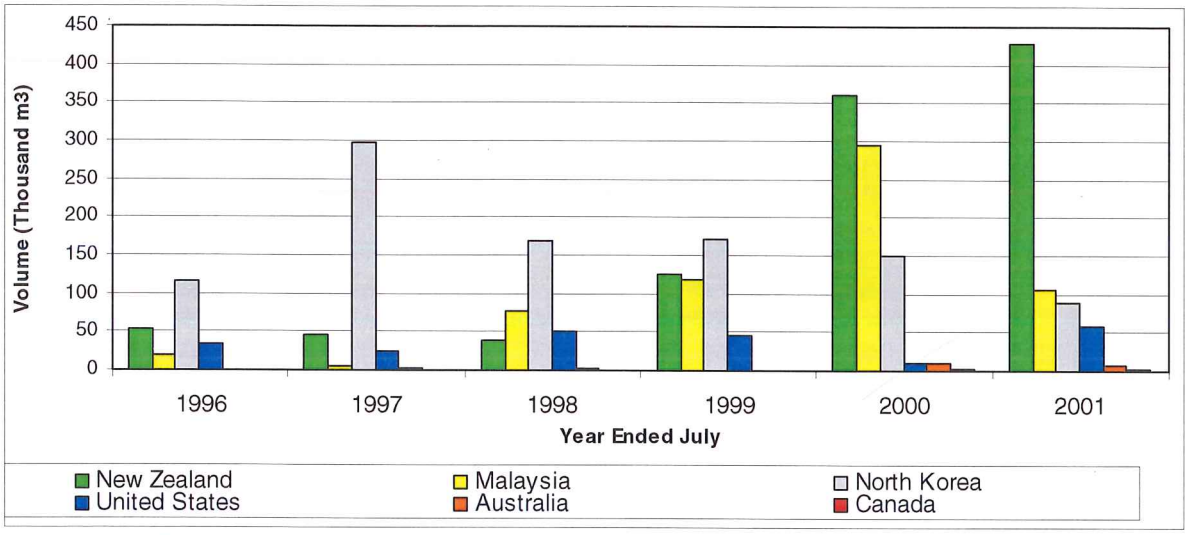
Source: International Monetary Fund (2002)

Russian Suppliers

Russia has accounted for nearly 85% of the imported coniferous roundwood market by volume since the late 1990s. Russian suppliers have a competitive advantage in the China market because the Sino-Russian agreement on forest products trade allows Chinese loggers to move their facilities to Russia.

Furthermore, the agreement includes a special tax treatment for Russian suppliers where they only have to pay half of the normal VAT (17%) for their exports to China (USDA, 2001b).

Figure 3.9 China: Imports of Coniferous Roundwood by Volume and Country (without Russia), 1996-2001.[69]



Source: World Trade Atlas: China Customs

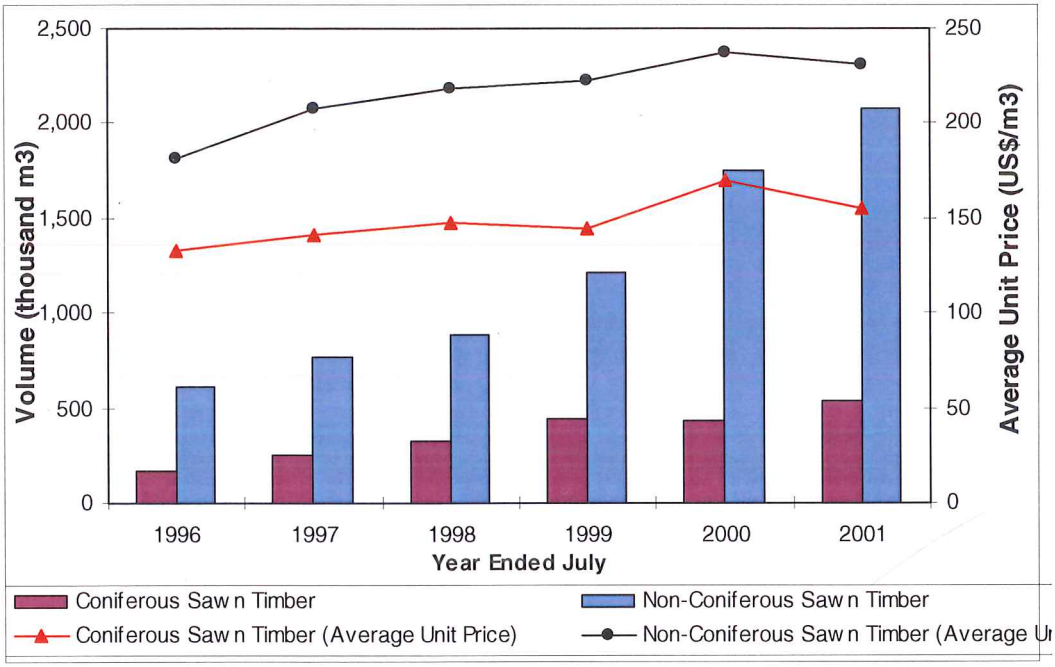
3.5.2 Sawn Timber[70]

Imports of sawn timber in China have increased rapidly in terms of volume (Figure 3.10 & Table 3.8). The volume of non-coniferous sawn timber imported has been much higher than coniferous (Figure 3.10). Figure 3.11 shows that the volume of coniferous sawn timber imported only accounted for 20% to 27% of the total imported market share between 1996 and 2001.

The proportion of coniferous sawn timber imported slightly increased from 20% in 1996 to 27% in 1999 for the year ended July. However, it has fallen to just over 20% as the volume of non-coniferous sawn timber imported has increased at a rate that is much faster than coniferous since 2000 (Figure 3.10).

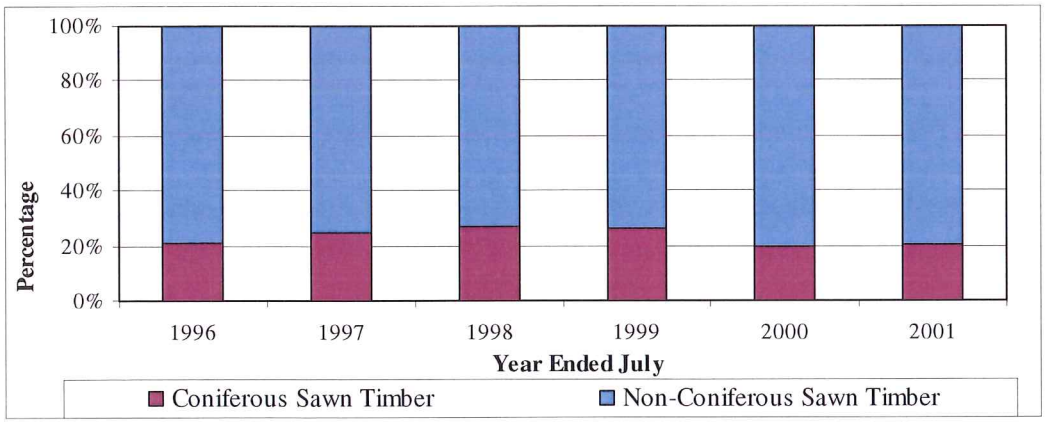
[69] Coniferous roundwood refers to HS 440320.
[70] Coniferous sawn timber refers to HS 440710, and non-coniferous sawn timber refers to HS 440799.

Figure 3.10 China: Imports of Sawn Timber by Volume (thousand m^3) **and by Average Unit Price** (c.i.f. US$/$m^3$), **1996-2001.**



Source: World Trade Atlas: China Customs

Figure 3.11 China: The Proportion of Total Volume of Coniferous and Non-Coniferous Sawn Timber Imported in China by Volume, 1996 - 2001.



Source: World Trade Atlas: China Customs

On average, the volume of coniferous and non-coniferous sawn timber imported in China has gradually increased at 27% and 28% per annum respectively whereas the nominal average unit price of coniferous and non-coniferous has increased at only 3% and 5% per annum respectively since 1996 (Table 3.7).

Table 3.7 China: Imports of Coniferous and Non-Coniferous Sawn Timber by Volume (thousand m^3) **and Average Unit Price** (c.i.f in US$/$m^3$), **1996 – 2001.**

Year Ended July	1996	1997	1998	1999	2000	2001
Volume of Coniferous Sawn Timber (thousand m3)	164	252	331	438	435	536
Percentage change (%)		53%	32%	32%	-1%	23%
Volume of Non-coniferous Sawn Timber (thousand m3)	610	772	888	1,213	1,753	2,081
Percentage change (%)		27%	15%	37%	45%	19%
Coniferous Sawn Timber (Average Unit Price)	133	141	148	145	170	155
Percentage change (%)		6%	4%	-2%	18%	-9%
Non-coniferous Sawn Timber (Average Unit Price)	182	207	219	222	238	231
Percentage change (%)		14%	5%	2%	7%	-3%
Difference in Average Price between Non-coniferous and Coniferous Sawn Timber						
(Non-coniferous - Coniferous)	49	66	71	78	68	76

Source: World Trade Atlas: China Customs

As with the roundwood market, the price differential between coniferous and non-coniferous sawn timber is very distinctive. Unlike the roundwood market, non-coniferous sawn timber imports are dominant in terms of volume. Non-coniferous sawn timber is, on average, higher priced than coniferous sawn timber as shown in Table 3.7. The difference in average price between non-coniferous and coniferous sawn timber has risen from US $49 to US $76 per m^3 between 1996 and 2001. The premium for non-coniferous sawn timber is very similar to the unprocessed non-coniferous roundwood premium which was at US $70 per m^3 in 2001.

Coniferous Sawn Timber

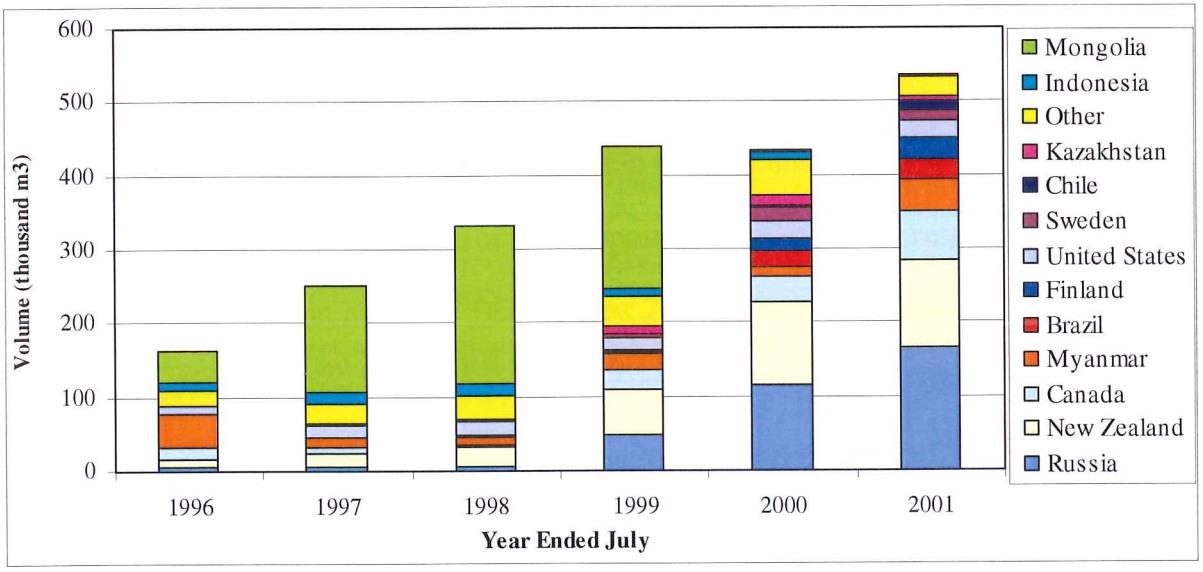
Prior to 1999, Mongolia, Myanmar, and Canada were the top three exporters of coniferous sawn timber to China (Figure 3.12). Since 2000 this composition has changed substantially with Russia, New Zealand, and Canada dominating. Russia dominates in both the coniferous roundwood and sawn timber markets in terms of volume, although it is not as overwhelmingly dominant in the coniferous sawn timber market as it is in the roundwood

market. Russia accounted for 31% of the total import volume in China in 2000 for year ended July, followed by New Zealand (22%), Canada (12%), and Myanmar (8%).

Mongolia dominated the coniferous sawn timber market in China prior to 1999, but since then it has disappeared from the market. Desertification in northern China and more frequent sandstorms in Beijing may have encouraged the Chinese government to reduce imports from Mongolia, replacing them with Russian and New Zealand imports.

New Zealand is facing strong competition from Russia, Canada, Myanmar, Brazil, and Finland. Despite the New Zealand dollar depreciating, and the average unit price dropping from US$ 208 to US$ 194 per m^3, New Zealand's market share has shrunk from 26% in 2000 to 22% in 2001 in terms of total import volume (Table 3.8). While most of the top seven ranked countries have increased or held their market share in terms of import volume, New Zealand and the United States have decreased their market shares.

Figure 3.12 China: Imports of Coniferous Sawn Timber by Volume (thousand m^3) **and Country, 1996 - 2001.**



Source: World Trade Atlas: China Customs

Table 3.8 China: Imports of Coniferous Sawn Timber by Volume (thousand m^3), **Country, Average Price** (c.i.f US$/$m^3$), **Country, 1999 – 2001** (year ended July).

	Volume (thousand m3)			Average Unit Price (US$/m3)			Market Share by Volume		
COUNTRY	1999	2000	2001	1999	2000	2001	1999	2000	2001
Russia	48	116	167	$ 105	$ 109	$ 111	27%	34%	35%
New Zealand	63	112	117	$ 216	$ 208	$ 194	35%	33%	25%
Canada	26	33	66	$ 133	$ 139	$ 134	15%	10%	14%
Myanmar	22	15	42	$ 71	$ 62	$ 67	12%	5%	9%
Brazil	3	22	29	$ 185	$ 152	$ 153	1%	6%	6%
Finland	3	14	28	$ 226	$ 221	$ 215	2%	4%	6%
United States	15	26	24	$ 368	$ 260	$ 295	8%	8%	5%
Other	-	-	-	-	-	-	0%	0%	0%
Total	179	339	474	$ 145	$ 170	$ 155	100%	100%	100%

Source: World Trade Atlas: China Customs.

3.5.3 Fibreboard[71]

The quantity of fibreboard imported to China has gradually increased since 1999. Currently, Germany, Malaysia, Australia, and Thailand have dominated the fibreboard import market in China in terms of quantity (Table 3.9). Germany has rapidly expanded its market share in China since 1998 despite its average unit price being at least 30% higher than most of its competitors, except Austria (Table 3.9). Its market share was risen from 7% in 1999 to 24% in 2001. Moreover, Germany has also replaced Malaysia to become the most important supplier in the Chinese fibreboard import market in terms of quantity.

New Zealand ranked as the fifth largest supplier in terms of both quantity and value in 2001. It accounted for 9% and 7% in terms of total import quantity and value respectively in the Chinese fibreboard import market.[72] Despite New Zealand export volumes increasing, Table 3.9 shows that New Zealand's market share has remained steady for the past three years. There has been an unchanged average nominal unit price over that period.

[71] Fibreboard refers to HS 4411 unless specified.
[72] Fibreboard import market refers to HS 4411.

Table 3.9 China: Imports of Fibreboard by Quantity (million kg), **Average Unit Price** (US$/kg), **and Country, 1999 – 2001** (year ended July).[73]

	Quantity (million kg)			Average Unit Price (US$/kg)			Market Share by Quantity		
Country	1999	2000	2001	1999	2000	2001	1999	2000	2001
Germany	35	127	178	0.82	0.69	0.63	7%	20%	24%
Malaysia	117	114	142	0.28	0.27	0.27	24%	18%	19%
Australia	44	62	91	0.33	0.33	0.32	9%	10%	12%
Thailand	71	85	90	0.28	0.28	0.30	15%	14%	12%
New Zealand	45	52	66	0.30	0.28	0.31	9%	8%	9%
Indonesia	55	52	53	0.36	0.27	0.29	11%	8%	7%
South Korea	28	35	39	0.41	0.34	0.33	6%	6%	5%
Austria	3	7	17	0.87	0.64	0.54	1%	1%	2%
Italy	5	21	17	0.45	0.35	0.33	1%	3%	2%
Canada	6	5	14	0.28	0.30	0.28	1%	1%	2%
United States	37	23	10	0.33	0.33	0.37	8%	4%	1%
Other	42	42	40	-	-	-	9%	7%	5%
Total	489	626	756	0.36	0.39	0.39	100%	100%	100%
% Change		28%	21%		8%	0%			

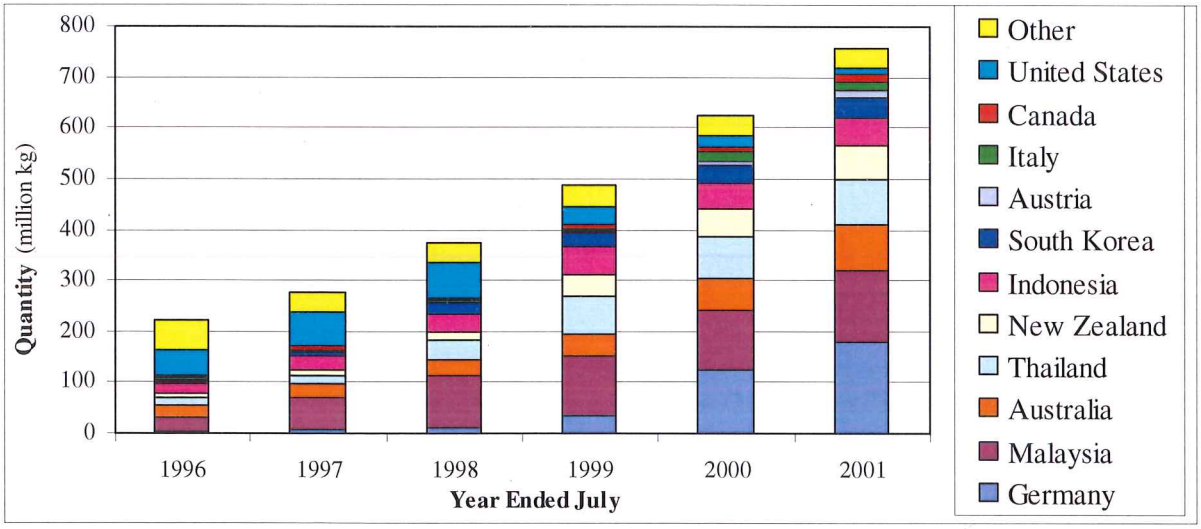
Source: World Trade Atlas: China Customs

South Korea, which is New Zealand's third major wood products export destination by value since the mid 1990s, contributed to 5% of the Chinese fibreboard import market in terms of quantity in 2001 (Table 3.9). Competition among countries in the fibreboard market has nearly forced the United States out of the Chinese fibreboard import market; and the market share from the United States has declined from 8% in 1999 to only 1% in 2001 (Figure 3.13).

The difference in import quantity prior to and after the implementation of the logging ban in July 1998 is not as obvious as in the coniferous roundwood market. One explanation is that domestic production in China has increased dramatically by the utilisation of small-diameter logs from domestic plantation forests, resulting in China becoming the largest medium density fibreboard (MDF) producer in the world (USDA, 2002). However, China has imported selective grades of fibreboard to supply the segments which cannot be satisfied by domestic production.

[73] Fibreboard refers to HS 4411 unless specified.

Figure 3.13 Imports of Fibreboard in China by Quantity (million kg) **and Country, 1996 – 2001** (year ended July).[74]



Source: World Trade Atlas: China Customs

For instance, Table 3.10 shows that China imported US$ 294 million worth of fibreboard in 2000 (year ended July),[75] of which, 43% was high density fibreboard (HDF) and 35% was medium density fibreboard (MDF) in terms of value. New Zealand accounted for 12% of the MDF import market and 10% in the other fibreboard market in 2001. New Zealand only accounted for 1% in each of the HDF and insulation board import markets in 2001 by value.

Table 3.10 China: Imports of Fibreboard from the World and New Zealand by Value (million US$)**, 2001** (year ended July)**.**

Description	**World** (million US$)	**New Zealand** (million US$)	**Market Share of New Zealand by Value** (%)
Total Fibreboard Imported[76]	**294.0**	**20.0**	**7%**
High Density Fibreboard[77]	127.7	1.7	1%
Medium Density Fibreboard[78]	102.3	12.3	12%
Insulation Board[79]	4.5	0.1	1%
Other[80]	59.5	6.0	10%

Source: World Trade Atlas: China Customs

[74] Fibreboard import market refers to HS 4411.
[75] Fibreboard can be classified into four categories: hardboard or high density fibreboard (HDF); medium density fireboard (MDF); insulation board; and other fibreboard.
[76] "Total Fibreboard Imported" refers to HS 4411 unless specified.
[77] **High density fibreboard (HDF) or Hardboard:** refers to HS 441111 and HS 441119.
[78] **Medium density fibreboard (MDF):** refers to HS 441121 and HS 441229.
[79] **Insulation board** [*non-compressed fibreboard, softboard*]: refers to HS 441131 and HS 441139.
[80] **Other** (density less than or equal to 0.35 g/cm^3): refers to HS 441191 and HS 441199.

Germany, Malaysia, Australia, and Thailand are the major competitors in the MDF import market whereas Thailand, Malaysia, Australia, and Indonesia are major competitors with New Zealand in the insulation board import market. Despite the competition from other countries, New Zealand has performed relatively well in the MDF market in terms of quantity since 1996. In contrast, China's import of HDF, insulation board, and other fibreboard from New Zealand declined in 2001 for the year ended July.

Table 3.11 China: Imports of Fibreboard from New Zealand by Quantity (million kg) **and Type of Fibreboard, 1996 – 2001** (year ended July).

Description	1996	1997	1998	1999	2000	2001
Total Fibreboard Imported	**8.9**	**9.3**	**16.4**	**45.1**	**52.1**	**65.8**
High Density Fibreboard	0.8	1.0	1.3	4.4	9.2	5.6
Medium Density Fibreboard	3.4	4.5	4.3	17.3	18.6	38.8
Insulation Board	0.1	0.8	0.6	0.1	0.5	0.2
Other	4.6	3.0	10.2	23.3	23.9	21.1

Source: World Trade Atlas: China Customs

3.5.4 Particleboard[81]

New Zealand only accounted for 1% of the market share in terms of quantity in the particleboard import market in 2001 (year ended July). Thailand, Malaysia, Belgium, Indonesia, and Germany are the major competitors in the particleboard import market, they accounted for 81% of the market share by quantity in 2001 (year ended July).

[81] Particleboard refers to HS 4410 unless specified.

Table 3.12 China: Imports of Particleboard by Quantity (*million kg*), Average Unit Price (c.i.f US$/kg) and Country, 1999 – 2001 (year ended July).[82]

	Quantity (million kg)			Average Unit Price (US$/kg)			Market Share by Quantity		
Country	**1999**	**2000**	**2001**	**1999**	**2000**	**2001**	**1999**	**2000**	**2001**
Thailand	41.0	53.7	80.1	0.25	0.24	0.27	32%	27%	32%
Malaysia	30.1	43.6	51.2	0.27	0.29	0.29	23%	22%	21%
Belgium	5.7	19.8	33.6	0.19	0.25	0.25	4%	10%	14%
Indonesia	12.9	13.4	20.9	0.30	0.27	0.29	10%	7%	8%
Germany	6.5	13.3	16.0	0.67	0.62	0.46	5%	7%	6%
Italy	0.9	8.8	15.7	0.53	0.25	0.23	1%	4%	6%
United States	18.7	22.8	6.6	0.30	0.29	0.18	14%	11%	3%
Chile	0.0	0.1	5.6	0.00	0.22	0.28	0%	0%	2%
Austria	0.3	3.0	5.3	0.89	0.49	0.45	0%	1%	2%
Australia	1.2	2.6	2.9	0.30	0.44	0.42	1%	1%	1%
New Zealand	2.8	7.3	2.4	0.23	0.36	0.25	2%	4%	1%
Other	9.2	11.2	6.9	0.00	0.00	0.00	7%	6%	3%
Total	129.3	199.6	247.4	0.30	0.30	0.29	100%	100%	100%

Source: World Trade Atlas: China Customs

3.5.5 Plywood[83]

New Zealand only accounted for 0.05% of the market share in terms of quantity in the plywood import market in 2001 (year ended July). Indonesia, Malaysia, South Korea, Cambodia are the major competitors in the plywood import market, they accounted for 96% of the market share in 2001 by quantity.

Non-tropical plywood with at least one layer of particleboard[84] is the only plywood category which New Zealand exports to China, and Indonesia is main competitor and accounted for 72% of the market share in this plywood category in 2001.[85]

[82] Particleboard refers to HS 4410 unless specified.
[83] Plywood refers to HS 4412 unless specified.
[84] Non-tropical plywood with at least one layer of particleboard refers to HS 441223 unless specified.
[85] Source: World Trade Atlas: China Customs. Year ended July.

Table 3.13 China: Imports of Plywood (*greater than 6 mm*) by Volume (m^3), Average Unit Price (c.i.f US$/ m^3), and Country, 1999 – 2001 (year ended July).[86]

	Quantity (m3)			Average Unit Price (US$/m3)			Market Share by Volume		
Country	**1999**	**2000**	**2001**	**1999**	**2000**	**2001**	**1999**	**2000**	**2001**
Indonesia	795,430	620,019	531,326	334	463	432	54.94%	59.38%	63.12%
Malaysia	542,904	284,988	167,437	268	319	294	37.50%	27.29%	19.89%
Korea, South	62,193	79,050	69,795	547	599	521	4.30%	7.57%	8.29%
Cambodia	3,271	22,749	32,170	659	612	517	0.23%	2.18%	3.82%
Taiwan	16,139	13,036	10,137	349	464	508	1.11%	1.25%	1.20%
Japan	2,216	2,348	5,265	448	340	536	0.15%	0.22%	0.63%
Singapore	2,403	1,913	5,134	386	523	466	0.17%	0.18%	0.61%
Finland	158	3,514	3,630	619	684	562	0.01%	0.34%	0.43%
Germany	750	1,261	3,169	673	629	484	0.05%	0.12%	0.38%
Russia	627	2,260	2,235	1,210	516	590	0.04%	0.22%	0.27%
South Africa	189	102	2,184	637	387	420	0.01%	0.01%	0.26%
Thailand	2,175	2,050	2,083	318	336	373	0.15%	0.20%	0.25%
Canada	1,389	1,049	1,535	228	242	295	0.10%	0.10%	0.18%
New Zealand	707	292	390	353	349	355	0.05%	0.03%	0.05%
Other	17,193	9,593	5,318	-	-	-	1.19%	0.92%	0.63%
Total	1,447,744	1,044,224	841,808	321	438	418	100.00%	100.00%	100.00%

Source: World Trade Atlas: China Customs

3.5.6 Veneer Sheet[87]

Malaysia, United States, Taiwan, Mongolia and Indonesia have dominated in the coniferous veneer sheet imports market in terms of quantity.[88] In terms of quantity, they accounted for nearly 97% of the total coniferous veneer sheet imported whereas New Zealand only accounted for 0.4% of the total quantity imported in 2001 for the year ended July (Table 3.14).

Although the proportion of coniferous veneer sheet in terms of quantity has increased from 2% in 1999 to 10% in 2001 (Table 3.15), imports of coniferous veneer sheet is relatively small in compare to the imports of non-coniferous veneer sheet.

[86] "Plywood" refers to HS 4412.
[87] "Veneer Sheet" refers to HS 4408 unless specified.
[88] "Coniferous veneer sheet" refers to HS 440810.

Table 3.14 China: Imports of Coniferous Veneer Sheet *(less than 6mm)* by Quantity (million kg), **Average Price** (US$/kg), **and Country, 1999 – 2001** (year ended July).[89]

	Quantity (million kg)			Average Unit Price (US$/kg)			Market Share by Quantity		
Country	**1999**	**2000**	**2001**	**1999**	**2000**	**2001**	**1999**	**2000**	**2001**
Malaysia	3.1	11.9	19.6	0.3	0.3	0.3	54.9%	78.2%	86.5%
United States	1.2	1.5	1.1	1.9	2.7	2.5	21.4%	9.9%	4.9%
Taiwan	0.5	0.6	1.0	0.5	0.6	0.8	8.0%	4.0%	4.5%
Mongolia	0.0	0.2	0.2	0.0	0.2	0.2	0.0%	1.3%	0.9%
Indonesia	0.4	0.4	0.1	0.4	0.8	1.9	7.9%	2.4%	0.6%
Romania	0.0	0.0	0.1	0.0	0.8	0.6	0.0%	0.1%	0.5%
Australia	0.0	0.0	0.1	0.0	2.1	1.8	0.0%	0.0%	0.4%
Canada	0.1	0.1	0.1	1.3	1.8	1.9	1.0%	0.4%	0.4%
New Zealand	0.0	0.0	0.1	2.0	2.3	1.7	0.1%	0.1%	0.4%
Italy	0.0	0.0	0.0	0.0	0.5	0.9	0.0%	0.2%	0.2%
Other	0.4	0.5	0.2	-	-	-	6.7%	3.4%	0.8%
Total	5.7	15.3	22.7	0.8	0.6	0.4	100.0%	100.0%	100.0%

Source: World Trade Atlas: China Customs

Table 3.15 China: Imports of Coniferous and Non-Coniferous Veneer Sheet by Percentage Volume, 1996 – 2001 (year ended July).[90]

Description	1996	1997	1998	1999	2000	2001
Non-Coniferous Veneer Sheet	177	185	156	262	283	202
Coniferous Veneer Sheet	43	30	6	6	15	23
Total Import Quantity (in million kg)	219	215	162	267	298	224
% Coniferous Veneer of the Total Import Quantity	19%	14%	3%	2%	5%	10%

Source: World Trade Atlas: China Customs

3.6 CHAPTER SUMMARY

In terms of the supply-side, the current and future wood supply in China is not clearly known because private production is not accounted in the Chinese official production statistics. Domestic plywood, fibreboard, and particleboard production have gradually increased while roundwood and sawn timber production have declined.

[89] "Coniferous Veneer Sheet" refers to HS 440810.
[90] "Coniferous Veneer Sheet" refers to HS 440810 whereas "Non-Coniferous Veneer Sheet" refers to HS 440890.

In terms of the demand-side, the apparent consumption per thousand capita for most wood products have increased, except for sawn timber. In addition, the demand for wood products from the housing construction, interior decoration, and furniture sectors is expected to increase.

As domestic wood production cannot satisfy the rising domestic demand from the housing construction, interior decoration, and furniture sectors, imports of wood products from other countries have increased. Unprocessed logs, sawn timber, plywood, fibreboard, particleboard, and veneer sheet accounted for 97% of the total wood products imported by value in 2001.[91]

New Zealand preformed relatively better in the coniferous unprocessed log and sawn timber markets against other countries (apart from Russian). Reducing sawn timber production and industrial roundwood supply from native forests in China have created an opportunity for New Zealand wood products. In contrast, New Zealand performed relatively poorer in the fibreboard, plywood, particleboard, and veneer sheet markets as the Chinese government has substituted solid wood products with domestic made wood-based panel products (USDA, 2001b).

In order to examine how New Zealand organisations perform in the Chinese wood products market, four organisations that are conducting forestry related businesses in China will be examined in Chapter 4.

[91] "Total wood imported" refers to HS 44.

Chapter 4 NEW ZEALAND EXPORT EXPERIENCE

The export experience of individuals and companies within the New Zealand forestry sector is rarely described. In order to collect in-market information regarding New Zealand wood products exporters, individuals in New Zealand organisations involved in exporting wood products to China were interviewed. The current in-market situation, the customers and end-users, and the problems and difficulties that arose in exporting New Zealand wood products to China were examined through the four interviews.

4.1 Sawn Timber Market: Craigpine Timber Limited

Background

Craigpine Timber Ltd is a privately owned company governed by a board of directors. Craigpine Timber Ltd owns 3 500 ha of timber plantations, and it also buy logs from other growers to ensure a consistent supply. They produce 115 000 m^3 of sawn timber per annum. Craigpine Timber Ltd does not provide any cut-to-order services due to technical constraints, but some New Zealand companies do provide a cut-to-order service for their customers. Craigpine Timber Ltd provides five different grades of sawn timber: Clear, Premium Cutting, Furniture Grade, Standard, and Industrial. The specifications of these grades are described in Appendix 4.1.

Mr Giller is the Group Marketing Manager of Craigpine Timber Ltd. He has been employed by Craigpine Timber Ltd for 19 years in the role of marketing manager. He has been extensively involved in the development of Asian markets and has a very good knowledge of the end uses of New Zealand pine and the most suitable grades for each end use application. Mr Giller is also the chairman of New Zealand Pine Exporting Companies Asia (NZPEC). NZPEC is a group of 15 sawn timber companies working together to open up markets in Asia.

Customers

Currently, the majority of Craigpine's customers in China are foreign-owned furniture manufacturers who are mainly from Singapore, Taiwan, and Hong Kong. Most of these furniture manufacturers have set up their production through joint ventures or direct investment in China, and are located in Guangdong and other southern provinces. Most are re-exporters who use New Zealand sawn timber for furniture manufacturing, then export to the United States, European countries, Japan, and other Asian countries.

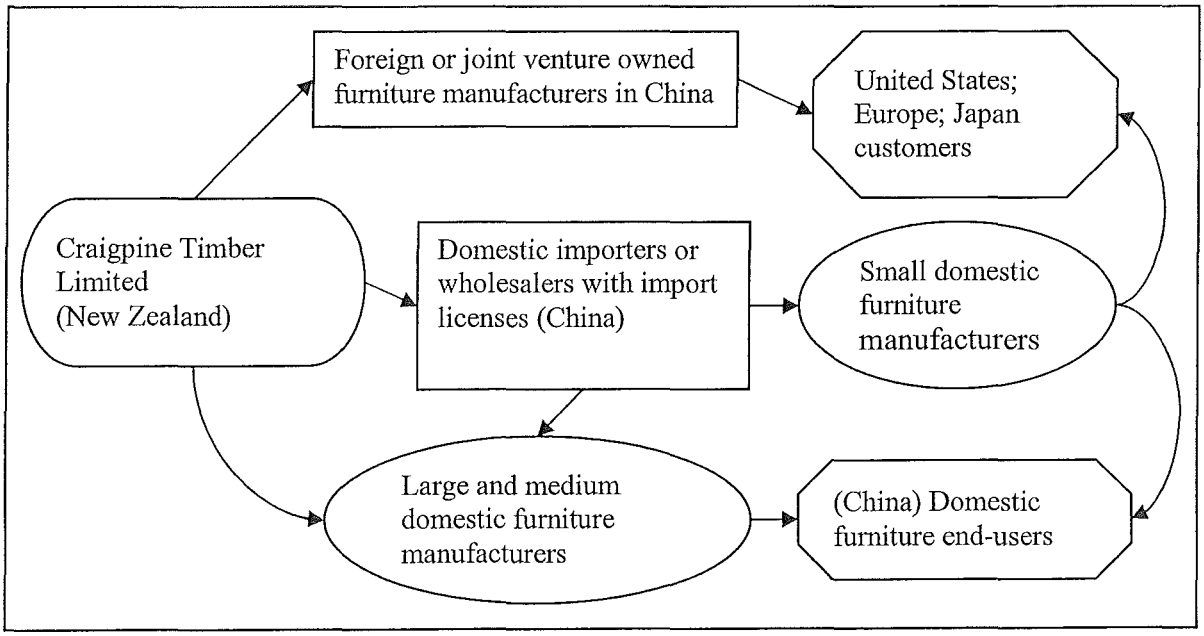
The grades and volumes required by Craigpine's customers vary. Mr Giller described that the bigger customers would require about 10 to 15 containers per month while the smaller customers would only require two to three containers per month. Craigpine Timber Ltd only uses 40 foot containers. Mr Giller mentioned that it is not economical to use 20 foot containers, and 40 foot containers are the minimum size to make the freight cost competitive. On average, each 40 foot container can deliver approximately 42 m^3 of sawn timber with 16 individual packs of sawn timber.

In terms of customers' concerns, Mr Giller stated that consistent and continuous supply is the main concern from his customers. Customers often ask the company to confirm the possible supply in the next three to six months. One of the main concerns for customers is that, if Craigpine cannot supply its sawn timber on time, its customers will not be able to sign any orders with their overseas buyers or they will not be able to fulfil their overseas orders on time. At the time of the interview, only a small proportion of Chinese customers requested a certified environmental certificate.

In terms of payment method and tariff, an irrevocable letter of credit payable in US dollars on sight of documents is the most common terms of payment. Alternatively, small domestic customers sometimes pay by cash. The end-buyers have to pay the 17% VAT (value-added tax). If wood products are sourced directly from the foreign suppliers, they cannot reclaim the 17% VAT; however, re-exporters and foreign-owned companies can reclaim up to 60% of the 17% VAT. All domestic and foreign-owned companies as well as re-exporters will have to pay the 17% VAT when China fully implements the WTO conditions.

In terms of shipment schedule, Mr Giller does not have any complaints regarding the shipping schedule in Southland as ships are available every two weeks. Depending on the destination, the journey to most major cities in China takes 20 to 25 days.

Figure 4.1 The Distribution Channels of Craigpine Timber Limited in China.



Problems

One of the major problems mentioned by Mr Giller is that the New Zealand forestry sector cannot reach the small domestic furniture manufacturers (Figure 4.1). Small furniture domestic manufacturers accounted for 40% of the total coniferous sawn timber consumption in China during 1998 (Sun, *et al.*, 1999). Therefore, improving New Zealand forestry sector's access to these small furniture manufacturers is urgently needed. Currently, there are several restraints which prevent the New Zealand forest industry from reaching these small furniture manufacturers:

- Firstly, the small domestic furniture manufacturers only demand small volumes, but the New Zealand forest industry does not have any warehousing facilities in China. Moreover, the wholesaling of wood products in China is fragmented. As a result, the small domestic furniture manufacturers cannot store a large inventory per order from both financial and quality aspects. Small containers might be a feasible solution although, Mr Giller mentioned that it is not financially feasible to use them.

- Secondly, although Craigpine Timber Ltd can distribute its products via the domestic wholesalers, these small domestic furniture manufacturers cannot reclaim the 17% VAT compared to zero VAT of domestic wood products, and 8.75% VAT of Russian wood products.

- Thirdly, although China gained accession to the WTO, it might take several years before the import licence and quota systems are fully abandoned.

In addition, competition is intense in the domestic sawn timber and roundwood markets with competitors mainly from Chile, Scandinavia, Canada, and Russia. Also, the word "pine" in Chinese is a very generous term as it includes pine, spruce, and fir in the Chinese domestic market.

Due to the fact that New Zealand pine is a relatively new species for both foreign-owned and small domestic furniture manufacturers, customer-based technical problems often arise from customers. Questions regarding the types of glue that should be used and the handling of kiln-dried sawn timber are the most common enquiries to Mr Giller.

Mr Giller was asked to make comments on the prospects for the New Zealand forest industry and the areas in which the industry must improve. Mr Giller stated that the sawn timber sector is doing quite well in the foreign-owned and joint venture industrial wood consumers market. Preservative-treated sawn timber is also another possible value-adding market. Success in the difficult to access domestic market would substantially increase the demand for New Zealand sawn timber.

In terms of improvements, Mr Giller mentioned that the industry should improve its overall performance in three aspects. First, the industry should develop a trustful relationship with its customers. Secondly, the industry should deliver a better and more consistent quality product. Thirdly, the industry should act quicker in addressing and providing solutions to the problems of its customers.

4.2 COLLECTIVE MARKETING: Wood New Zealand Limited

Background

Gerald Hunt was the former CEO of Wood New Zealand Limited. It was set up in 1998 to promote New Zealand pine worldwide. The organisation was formed by various forestry companies, regional councils, and port authorities. It promoted New Zealand pine products to the Chinese wood industry in Shanghai, Beijing, and Guangzhou.

Targeted Customers

The organisation was present at trade fairs in China to promote New Zealand pine to various wood consumers in China. Gerald Hunt believes that the organization achieved two important goals in 14 months.

1. Exposure of New Zealand wood products.
2. Contacts with Chinese government bodies and industries.

The organisation succeeded in lobbying with the Chinese government to set up a building standard that would include the use of New Zealand pine for internal partitions. The organisation was close to achieving an agreement on the acceptance of using New Zealand pine for the interior partitions in China. However, due to limited funding, Wood New Zealand passed this issue to the New Zealand Forest Industry Council.

During the APEC meeting in 1999 Jiang Zemin, the Chinese President, came to New Zealand. Gerald Hunt and Selwyn Plantation Board Limited introduced the President to the concept that New Zealand forest products are produced from forests managed under sustainable management regimes. As the visit had coverage on the Chinese television, New Zealand forest products were exposed nationwide. After the APEC meeting, New Zealand forest products also gained a reputation as being green, clean, and sustainable by the Chinese government.

Problems

Gerald Hunt was asked to discuss some of the major problems faced by the New Zealand industry in acceptance of New Zealand pine in the Chinese wood products market in China. One of the difficulties in advertising New Zealand wood products in China is in describing the New Zealand log grade system in China. Hunt stated that some Chinese wood-users are very confused regarding New Zealand log grades and their appropriate uses. Another

problem faced by collective marketing is the lack of funding from the government as well as the New Zealand forestry sector. As a result, New Zealand pine is still not recognised for uses in structural and permanent construction by the Chinese Central Government, Ministry of Construction, and the building industry.

Although Gerald Hunt is not involved in the export of New Zealand forest products to China, his friend Mr Bill Lu was introduced to answer some of the questions in relation to the Chinese wood products market.

4.3 ROUNDWOOD (LOGS) EXPORTER: Ecomex Limited

Background

Mr Bill Lu is working in Ecomex Limited. He is mostly involved in log exports from New Zealand to eastern and southern China. The three main destinations of his company's log shipments to China are Zheungjigang (Jingsu province, south of Shanghai), Huangpou (Guangdong province), and Shenzhen (north of Hong Kong). Currently, there is no requirement for certification from the Forest Stewardship Council or other environmental certification authorities.

Customers

Most of Mr Lu's customers are the Chinese wholesalers (wood yard), re-manufacturers, and housing developers. The majority of these clients are using New Zealand pine roundwood (logs) for plywood manufacturing, packaging, and temporary formwork in the construction sector. Most of his customers are State-owned companies, and only a few customers are private owned wholesalers. On average, the small customers require about 5 000 to 10 000 m^3 per month whereas the large customers require from 20 000 to 30 000 m^3 per month. In

terms of dimension, Mr Lu stated different customers might require different sizes, especially cutting length. In addition, Mr Lu cited that most of his Chinese customers are price sensitive, and small changes in price would greatly influence their orders.

Most customers are wholesalers and large plywood plants, they are very professional, and have not requested any technical assistance. However, Lu's customers are still facing difficulties in the Chinese wood product market.

The most common complaint from his customers is the inconsistency of log grades from New Zealand sources. For example, if a customer requires a shipment of A grade logs, the company will have to procure from various forest companies such as Fletcher Challenge Forests and Carter Holt Harvey, or Rayonier. There are still variations between different supplies of A grade logs.

Blue sapstain is also a problem if logs wait for a long time after harvest. However, it is not a big issue for Mr Lu as most of his consumers are either wholesalers or re-manufacturers for temporary construction; therefore, the problem of sapstain is not as serious as for sawn timber exporters.

4.4 ROUNDWOOD (LOGS) EXPORTER: Janett & Associates

Background

Dave Janett has been involved in the forestry industry for 10 years. The major business of his company is to provide management services from harvesting to the wharf. Janett & Associates has exported logs to China in the past 12 to 14 months. They mainly procure their forest resources from Evergreen Forests (forests on West Coast), City Forests of Dunedin, and private forest owners. They also have a joint venture with Selwyn Plantation Board.

There are four types of log grades which are provided by the company for the Chinese wood products market:

1. A Short (3.8m to 4m long)
2. K Short (3.8m to 4m long)
3. KI
4. Pulp

Customers

The major Chinese customer of Janett & Associates is China International Trust and Investment Corporation (CITIC) although they also have independent customers (Figure 4.2). Most of the logs are for domestic purposes such as plywood plants, sawmills, furniture manufacturing, trading yards which deals with smaller customers, and DIY stores in China. Order sizes range from 5 to 15 thousand JAS m^3 per month.[92] The larger customers require about 15 thousand JAS m^3 per month whereas the smaller customers only require about five to six thousand JAS m^3 per month. Janett & Associates provides "mix-and-match"[93] service for those customers who only require five to six thousand JAS m^3 per month. For the mix-match service, shipments often go to China via South Korea as shown Figure 4.3.

[92] "JAS" refers to Japanese Agricultural Standard.
[93] "Mix-and-match" service refers to a shipment with different customers (mostly via South Korea), and loaded with mixed log grades.

Figure 4.2 Janett & Associates' Distribution Channels in the Chinese Wood Products Market.

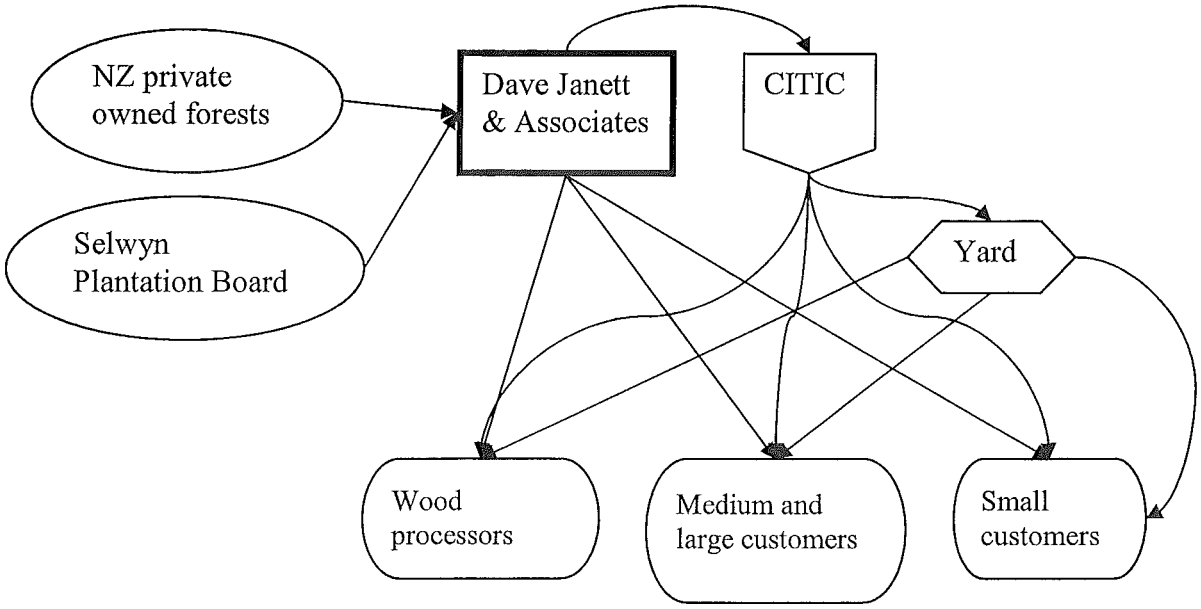
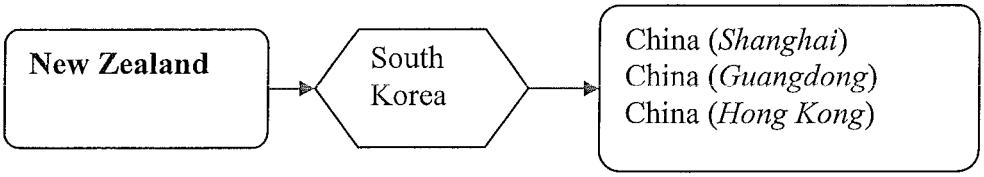


Figure 4.3 Destination Routes for Mix-and-Match Service.



Price, consistent supply, and wood quality are the most important factors when their Chinese customers are choosing their sources of supply. Apart from New Zealand pine, Mr Janett sometimes receives orders from China for other alternative species such as Douglas-fir, poplar, and redwood.

Problems

Janett & Associates' performance has been well received by the customer base. However, there are some difficulties faced by Janett & Associates and the New Zealand forestry sector in conducting business in the Chinese wood products market. Phytosanitary requirements and the unbalanced demand of log grades are the major difficulties faced.

Phytosanitary Requirement: Fumigation

Under the current phytosanitary requirement in China, both debarked logs and logs with bark required a phytosanitary certificate. For debarked logs, tolerances for bark are 5% on any individual log and 2% on any batch of logs; soil is prohibited, logs should be free from quarantine pests. For logs with bark, insecticide treatment with either phosphine or methyl bromide is required.

For above deck fumigation, it must be carried out by using methyl bromide. For under-deck fumigation, phosphine treatment can be used; it requires logs to be sealed for 10 days on board. Currently, Methyl bromide fumigation costs approximately US $1 to $1.5 /JAS m^3 whereas phosphine costs about US $0.3 /JAS m^3. The phytosanitary requirement significantly affects the industry in terms of cost and time. As a result, logs that are exported to China are sometimes stored under the deck whereas the logs that are exported to Korea are stored above the deck, if there is a mix-and-match shipment.

Unbalanced Market Demand

The second issue is the unbalanced market demand from China. Many Chinese buyers are only interested in certain log grades such as KI and pulp. As a harvested tree produces a range of log grades, companies cannot harvest the trees just for these specific grades, and the company must find a market to consume the other grades in order to supply its Chinese customers. In addition, Mr Janett stated that the volumes demanded by many Chinese customers are in excess of what can be supplied by many small and medium companies.

Shipping cost

Due to the fact that most unprocessed logs exported to China are low grade logs, Mr Janett stated that it is not very profitable to ship these log grades from New Zealand to China. The shipping cost for logs accounts for approximately one third of the total price (*in terms of US$/ JAS m^3 c.i.f*). Shipping cost depends upon the state of the global economy and the agriculture industry in New Zealand. Because New Zealand has the disadvantage of isolation from the major continents, the backloads from Asia to New Zealand are usually either empty or loaded with fertiliser. If the New Zealand agriculture sector is booming, more fertiliser is required and this will drive down the shipping cost for logs.

Exchange Rate & Value-Added Wood Products

The New Zealand currency is highly volatile. Exports of high quality logs involve more financial risk due to the changes in exchange rate. Janett & Associates uses a rolling hedge financial management to reduce the risk of loss from the volatile currency market as follows:

1-month ahead = 100% hedged
2-month ahead = 50% hedged
3-month ahead = 20% hedged

Imperfect Market Information

Mr Janett mentioned that his company often receives interest from Chinese customers who are looking for log supply; however, there are two problems which he must overcome before he gets down to business. Firstly, there is no credit history or other alternative ways to gauge the reputation of these potential customers.

Furthermore, Mr Janett stated that both the Korean and Chinese log markets are very sensitive to price changes. He commented that the Korean market is a structured market with bigger fluctuation in terms of the log prices; in contrast, the Chinese market is fragmented and less information is provided to the market, with less volatile log price as a result.

Quality

Most of the Chinese customers demand lower grades and they already know the quality to be expected. As a result, Mr Janett did not receive any complaints from his customers regarding log quality, except for occasional complaints about the length of logs being shorter than specified.

Warehousing and Human Resources

Mr Janett stated that lack of warehousing facilities and representatives in the domestic Chinese market are the major problems faced by the New Zealand forestry sector. In addition, New Zealand companies must find appropriate staff both onshore and offshore to support daily marketing activities. Mr Janett commented that developing a trustful and sustainable relationship with Chinese customers is the most important key to success in the Chinese wood products market.

Prospects for the New Zealand Forestry Sector

Mr Janett suggested that there were a number of issues regarding roundwood supply which may constrain the supply of New Zealand forest products to the China market:

- The incremental supply of *P. radiata* has not actually happened because most of the incremental volume is from small private land owners who are willing to wait until the log prices are better before harvesting. In contrast, large forest corporations must harvest their forests continuously to meet their cash flow requirements.
- The insufficient supply of harvesting crews, along with expensive freight cost, and poor infrastructure developments in some regions have restrained the volume output in New Zealand.
- The New Zealand currency is highly volatile and may discourage the development of secondary processing in New Zealand due to the fluctuations in exchange rate.
- More financial risk is involved for exporters of value-added wood products and even the high grade log exporters due to the volatile New Zealand dollar.

4.5 CHAPTER SUMMARY

Information from the four interviews provided better understanding of the use of New Zealand wood products in the Chinese wood products market. The four individuals describe that the use of New Zealand wood products are mainly for plywood and furniture production.

Despite trade barriers such as import licensing being partially removed, the import market will take several years to be fully deregulated. In addition, lack of warehousing facility for New Zealand wood products suppliers is one of the structural problems in accessing small domestic industrial wood consumers. Furthermore, all imported wood products will be continuously facing the 17% VAT. Moreover, phytosanitary requirement has become a non-tariff trade barrier for the New Zealand forestry sector.

Price, quality, consistent supply are the most important factors which will influence the industrial wood consumers to choose New Zealand forest products. In addition, developing a trustful relationship with the industrial wood consumers is also as important as the product attributes.

This information established the background of how the industrial wood consumers using New Zealand wood products in China, which is very important for developing the industrial wood consumer survey in Chapter 6. However, information for the end-users (final consumers) is not examined. Therefore, a review of Chinese wood products end-users will be conducted in Chapter 5.

Chapter 5 CONSUMER BEHAVIOUR

Since China's market deregulation, wood consumption is mainly driven by final consumers rather than central planners. Many reports (Market Research Centre, 2001; USDA, 2001; Freese, 2000; Longo & Gonzalea, 2000; and Zhang, *et al.* 1998) describe that Chinese wood consumers are substantially different from many western countries. It is important for the New Zealand forestry sector to understand their consumer behaviour, and align New Zealand wood products in the Chinese wood products market. Therefore, the end-users (final consumers) and the industrial consumer behaviour in relation to the housing construction, interior decoration, and furniture sectors will be examined in this chapter.[94]

5.1 END-USERS

In this study, end-users (final consumers) refer to the property owners and furniture buyers. The Chinese end-user behaviour in relation to the housing construction, interior decoration, and furniture sectors will be examined in this section.

Housing Construction Sector

In relation to the housing construction sector, wood framed housing accounts for less than 0.6% of the total housing units starts in 2001 (USDA, 2002). Wood products are rarely used for structural purposes. The majority of wood products are used for temporary concrete formwork (USDA, 2002).

[94] In this study, end-users refer to the property owners and furniture buyers, whereas industrial wood consumers refer to the wood processors and manufacturers.

Individual houses tend to be unpopular for many potential homebuyers. For example, according to a survey of potential homebuyers conducted in Guangzhou by East Marketing Research Co Limited between June and December 2000,[95] respondents were asked to rank their preferred number of floors for a housing unit. The results are summarised in Table 5.1. There are not many potential homebuyers who preferred individual housing units, only 1% of the respondents intended to purchase such a home.

More than 50% of the respondents prefer to purchase an apartment unit above seven floors. In contrast, 45% of the respondents prefer to purchase an apartment unit below seven floors. This survey did not find out the reasons, the East Marketing Research Co Limited analyst concluded that unreliable and inadequate elevator service would be the main factors that drive homebuyers away from high-rise apartments. Although this indicates majority of Chinese still prefer high-rise apartments, the problem of elevator service has positive implications for the New Zealand forestry sector. There is a possibility to promote wood framed multi-storeys apartments in China as such building can be built to at least seven floors.[96]

Table 5.1 Homebuyer Preferences: Number of Floors. Guangzhou, June – December 2000.

Number of Floors	Percentage (%)
Individual housing unit	1%
Lower than 7 floors	44%
8 to 17 floors	28%
Higher than 18 floors	25%
Other	2%

Source: East Marketing Research Co Limited (2002).[97]

[95] Source: East Marketing Research Co Limited. 2000. (http://www.emr.com.cn/fdc/article12.htm) [15 November 2001]

[96] Dr Walford, G. B. Engineer. New Zealand Forest Research Limited. Personal communication. 1 February, 2003. Face-to-face interview.

[97] Source: East Marketing Research Co Limited. 2000. (http://www.emr.com.cn/fdc/article12.htm) [15 November 2001]

Interior Decoration Sector

In relation to the interior decoration sector, the majority of households use wood-based flooring in most living areas, except in the bathroom and kitchen where tiles and polyvinyl are used.[98] For the main entrance, typically there is a two-door system with a stainless steel door and a wood-based door (Freese, 2001). Their species preference ranges from European beech, temperate hardwood to tropical hardwood, and knots are not preferred by most Chinese households (USDA, 2001b). The preference for clear timber has positive implications for expanding the use of New Zealand wood products for wood-based flooring and door manufacturing. The demand for pruned New Zealand wood products is likely to increase in future. However, the traditional use of non-coniferous species presents a huge challenge in promoting New Zealand wood products for interior decoration purposes.

Furniture Sector

In relation to the furniture sector, most Chinese prefer hardwood furniture due to its handsomeness and durability, but they are still buying furniture made from wood-based panels because of its availability and low cost (Trachtenberg, 1997). High quality solid wood furniture has little resale value as Chinese are cautious when buying used-furniture (USDA, 2001a). Younger Chinese tend to like modern designs whereas older people tend to like traditional pieces (Trachtenberg, 1997). Younger generation has positive implications for using New Zealand wood products or New Zealand made furniture, although the traditional use of non-coniferous species still exist in many furniture buyers.

[98] Tsang, P. Director, Hawaii Engineering Limited. Hong Kong. Personal communication. 10 February, 2002. Face-to-face interview.

5.2 INDUSTRIAL WOOD CONSUMERS

In this study, "industrial wood consumers" refers to Chinese wood processors and manufacturers. There are few publications that describe these industrial wood consumers. There are several publications available which could provide some background of Chinese industrial wood consumers' perceptions as well as the Chinese wood products market. However, the changing consumer behaviour and China's accession to the WTO limit the relevance of the information provided by these publications.

Zhang *et al.* (1998) examined the perception of 20 wood products importers (with import licences) that accounted for 90% of all wood imports in 1997. The study invited these 20 wood importers to rank the overall performance of the exporting companies from five regions (*United States; Indonesia & Malaysia, Russia & its former countries, New Zealand, and Hong Kong & Taiwan & Singapore*) over the past 10 years with respect to seven determinant aspects (*price, quality, transportation, service, credit, reputation, promotion*). Zhang *et al.* (1998) found that New Zealand performed well in the aspects of reputation and promotion among other regions. In contrast, New Zealand only received an average score for price, quality, transportation, and service. New Zealand received the worst score for credit.

Zhang *et al.* (1998) indicated that the overall performance of the New Zealand forestry sector was regarded as average compared to other regions. However, the targeted respondents in their study were the 20 importers with import licences who at that time of the study imported nearly 90% of all the wood products in China. The perceptions of the industrial wood consumers who will now be permitted to import directly from source have not been evaluated.

China's accession to the WTO in 2001 means that China's import licensing system can no longer function as a trade barrier and must comply with the principles of national treatment and non-discrimination within a 3-year period from the date of accession (US Trade Development, 2002), 10 November 2001.[99] All the industrial wood consumers will be able to import without import licences.

Meanwhile, Cai (1998) examined the Chinese wood product market and conducted a survey during a trade show in 1997. The survey involved 19 Chinese industrial wood consumers and organisations being asked questions regarding their perception of New Zealand pine. Surprisingly, one-third of the respondents said that they did not have any knowledge of New Zealand pine while one-third of them considered that the image of New Zealand pine is inferior and they generally use it for packaging. Only one-third of respondents suggested that New Zealand pine is suitable for products such as door-skins and plywood.

Recently, Mr Giller, [100] Mr Hunt[101], and Ms Liu[102] reported that these negative perceptions and the lack of knowledge about New Zealand pine widely exist among Chinese industrial wood consumers. Information gaps also exist between the New Zealand forestry sector and the Chinese industrial wood consumers.

[99] Source: World Trade Organization. (http://www.wto.org/english/news_e/pres01_e/pr252_e.htm) [10 January 2002]

[100] Giller, B., Group Marketing Manger, Craigpine Timber Limited., Winton, New Zealand. 24 March 2002. Telephone and Email.

[101] Hunt, G., Former CEO, Wood New Zealand., Auckland, New Zealand. 4 April 2002. Telephone.

[102] Liu, J., Account Manager, Wood, Building & Interior, Trade New Zealand, Auckland. 15 March, 2002. E-mail and telephone.

5.3 CHAPTER SUMMARY

Chinese end-users and industrial wood consumer behaviour are different to the consumer behaviour in many western countries. For example, in the housing construction sector, wood framed housing is not widely accepted for many Chinese homebuyers as in many western countries, such as in New Zealand. Moreover, in the interior decoration sector, wood-based flooring is widely used in China instead of carpet. Furthermore, in the furniture sector, furniture buyers prefer hardwood species rather than coniferous. Although there are many challenges in promoting New Zealand wood to Chinese end-users, this chapter highlighted the positive implications that the acceptance of wood framed multi-storeys apartment by the potential homebuyers could have, if the building and fire codes include the use of New Zealand wood products. In addition, the younger generation tends to be not as strongly focused on non-coniferous species as the older generation. Hence, there is an opportunity for using New Zealand wood products in the housing construction, interior decoration, and furniture sectors.

New Zealand pine can be used in many different areas. Cai (1998) indicates that the negative perception and the unfamiliarly of using New Zealand pine by industrial wood consumers have limited the use of New Zealand wood products in the Chinese wood products market. In order to change the negative perception and increase their interests in using New Zealand wood products, it is necessary to identify the important factors that influence these wood consumers to adopt a new wood product. In the next chapter, the factors that will influence industrial wood consumers to adopt a new wood product and their wood consumption behaviour will be examined.

Chapter 6 INDUSTRIAL WOOD CONSUMERS

The industrial wood consumers within the housing construction, interior decoration, and furniture sectors have been described as the most important wood consuming sectors in China (USDA, 2002 and Sun *et al.*, 1999). Understanding the preferences and perceptions of these industrial wood consumers is essential to align New Zealand's wood products to the appropriate market. However, the New Zealand forestry sector has limited information regarding the factors that will influence these consumers to adopt a new wood product; the stakeholders who are involved during the decision process; their wood consumption behaviour, distribution channels, and end-uses. The New Zealand forestry sector requires more up-to-date information through an analytical approach to examine the industrial wood consumers. This chapter describes the results of a survey of the industrial wood consumers to address this information gap.

6.1 BACKGROUND

One hundred questionnaires were distributed during two trade shows and on-site visits for each sector in Guangdong province and Hong Kong.[103] The response rates were 19%, 36%, and 52% respectively for the housing construction, interior decoration, and furniture sectors.[104]

[103] Only respondents who operate businesses in mainland China were invited to participate in this survey. Hong Kong based respondents were not examined in this study.

[104] Actual response rates would be even lower because not every returned survey was fully completed. Due to the large population and very small sample size in this study, partially completed questionnaires were used in order to increase the sample size (partially completed questionnaires refer to questionnaires with less than 5 questions incomplete, but not including the questions referring to the perceptions on New Zealand wood products). As a result, sample size (n) in this study would be slightly different among different questions.

Respondents' Business Fields

The number of respondents by business field is summarised in Table 6.1.

Table 6.1 The Number of Respondents by Business Field.

RESPONDENTS BY BUSINESS FIELD	NUMBER OF RESPONDENTS
Housing Construction Sector	
• Wood processors	7
• Construction contractors	12
Interior Decoration Sector	
• Wood-based interior decoration material manufacturers	36
Furniture Sector	
• Wood-based indoor furniture manufacturers	52

Housing Construction Sector: Wood Processors & Construction Contractors

In the housing construction sector survey, 19 companies participated, of which seven companies were wood processors, and twelve companies were construction contractors.[105] Most wood processors report that they are involved in importing primary wood products for wood processing and selling their products (e.g. plywood) to the domestic market. Most of their products were used for temporary construction. Only one respondent has been involved in exporting pre-fabricated wooden frames to the Japanese residential market.

Most construction contractors state that housing construction was their core business field. Only two companies report that they have also been involved in wood processing because they would like to integrate their business and secure their timber supply.

[105] Of the 12 construction contractors, 2 companies indicated that they were involved in both wood processing and construction contracting, but they are mainly concentrated as contractors instead of wood processors, so they are categorised as construction contractor in this study.

Interior Decoration Sector: Interior Decoration Material Manufacturers

In the interior decoration sector survey, 36 interior decoration material manufacturers participated, of which 21 respondents were "export" focused (two respondents did not specify whether they were export or domestic focused). Wood flooring, mouldings, doors, wall panels, and cabinets are the major products manufactured by the respondents.

Furniture Sector

In the furniture sector survey, 52 indoor wood-based furniture manufacturers participated. They are mostly involved in domestic wholesaling and export as part of their value chains. In addition, five respondents indicate that they are also involved in furniture retailing. Dinning tables, chairs, sofas, computer desks, study desks, bookshelves, and beds are the major products manufactured by the respondents.

6.2 Factors That Will Influence the Industrial Wood Consumers to Adopt a New Wood Product

Respondents from the housing construction, interior decoration, and furniture sectors were invited to provide importance ratings on the eight determinant factors that may influence respondents to adopt a new wood product. The eight determinant factors were: **A.** ***Wood Properties***; **B.** ***Price***; **C.** ***Availability***; **D.** ***Product Quality***; **E.** ***Services***; **F.** ***Environmental Issues***; **G.** ***Customer Preferences***; **H.** ***Experiences of Other Users***. Importance rating ranges from 1 to 9, where 1 refers to the least important factor and 9 refers to the most important factor.

Testing Importance Ratings Given by Wood Processors and Construction Contractors

In the housing construction sector, two groups of targeted respondents (*wood processors* and *construction contractors*) were identified in the survey. An independent sample t-test was used to test whether the importance ratings given by these two groups are significantly different. The results indicate that the respondents of wood processors and construction contractors are not significantly different at the 5% level. Hence, the importance ratings given by wood processors and construction contractors can be combined as the housing construction sector.

Testing Respondents who are Involved and Not Involved in the Decision-making Process

The independent sample *t-test* was used to test whether the importance ratings given by respondents who are involved in the decision-making process are different from those who are not involved. The results of the independent sample *t-test* indicate that the importance ratings given by most respondents are independent at 5% level regardless of whether they are involved in the decision-making process or not. The exception is in the interior decoration sector where ratings of *Product Quality* and *Customer Preferences* are significantly different. An assumption has been made that whether or not the respondents are involved in the decision-making process will not influence the importance rating given by the respondents. Most of the importance ratings in the interior decoration sector and other sectors are independent regardless of whether they are involved in the decision-making process or not. As a result, all the results were combined in this study.

6.2.1 The Eight Determinant Factors

Housing Construction: Wood Processors

The ratings given by the wood processors are summarised in Figure 6.1 and Appendix 6.1. The rankings from the most important to the least important factors are *Price* > *Environmental Issues* > *Wood Properties* ≈ *Services* > *Availability* ≈ *Product Quality* > *Experiences of Other Users* > *Customers Preferences*.

Housing Construction Sector: Construction Contractors

The ratings given by the construction contractors are summarised in Figure 6.2 and Appendix 6.2. The rankings from the most important to the least important factors are *Price* > *Environmental Issues* > *Wood Properties* ≈ *Services* ≈ *Availability* > *Product Quality* > *Experiences of Other Users* > *Customers Preferences*.

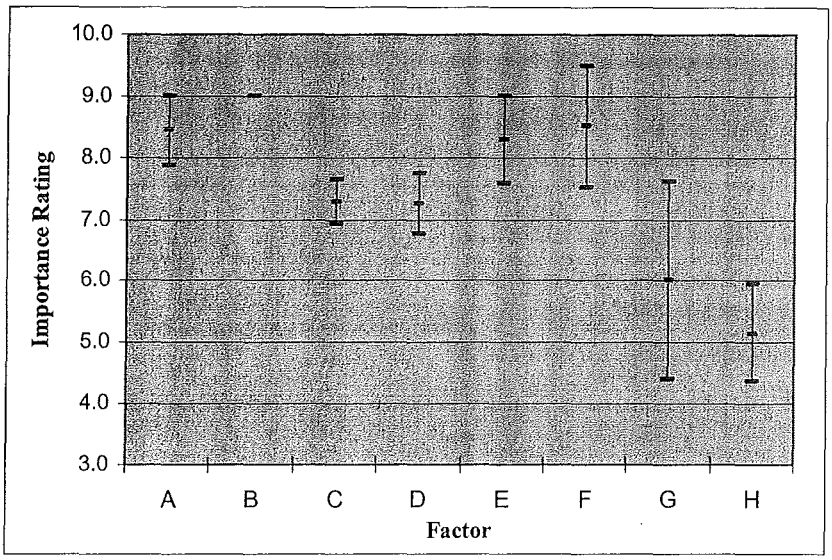
Interior Decoration Sector: Interior Decoration Material Manufacturers

The ratings given by the interior decoration materials manufacturers in the interior decorator sector are summarised in Figure 6.3 and Appendix 6.3. The rankings from the most important to the least important factors are *Price* > *Environmental Issues* ≈ *Services* > *Product Quality* > *Wood Property* > *Availability* > *Experiences of Other Users* > *Customer Preferences*.

Furniture Sector: Furniture Manufacturers

The ratings of the furniture manufacturers in the furniture sector are summarised in Figure 6.4 and Appendix 6.4. The rankings from the most important to the least important factors are *Price* > *Environmental Issues* > *Services* > *Wood Properties* > *Availability* ≈ *Product Quality* > *Experiences of Other Users* > *Customers Preferences*.

Figure 6.1 Housing Construction Sector: Wood Processors – The 95% Confidence Intervals: Importance Rating with Respect to the Eight Determinant Factors.



Keys:

A = Wood Properties

B = Price

C = Availability

D = Product Quality

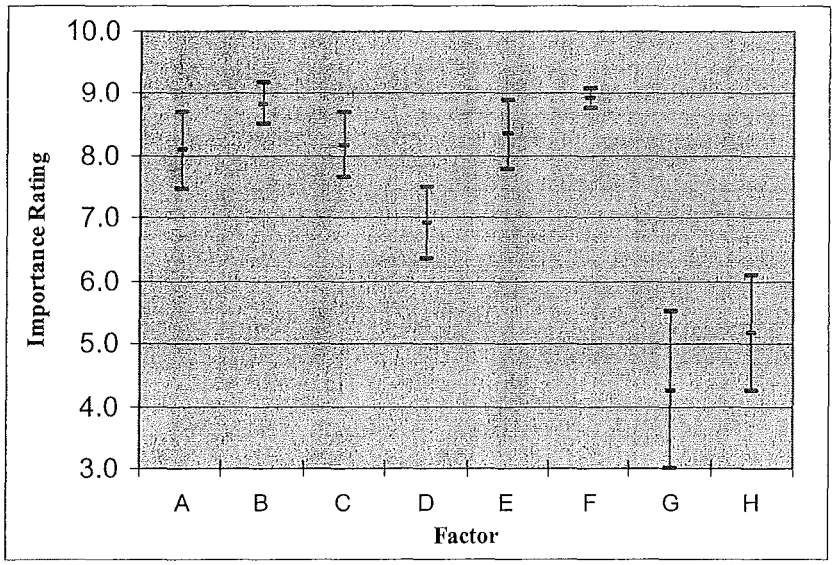
E = Services

F = Environmental Issue

G = Customer Preferences

H = Experiences of Other Users

Figure 6.2 Housing Construction Sector: Construction Contractors – The 95% Confidence Intervals: Importance Rating with Respect to the Eight Determinant Factors.



Keys:

A = Wood Properties

B = Price

C = Availability

D = Product Quality

E = Services

F = Environmental Issue

G = Customer Preferences

H = Experiences of Other Users

Figure 6.3 Interior Decoration Sector: Interior Decoration Material Manufacturers – The 95% Confidence Intervals: Importance Rating with Respect to the Eight Determinant Factors.

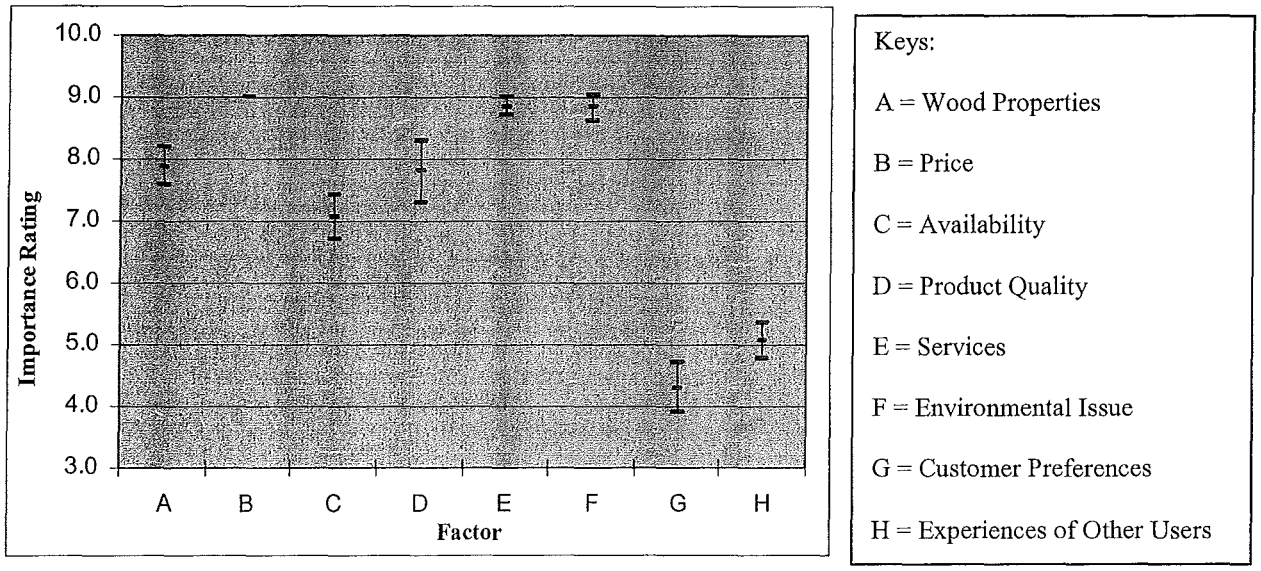
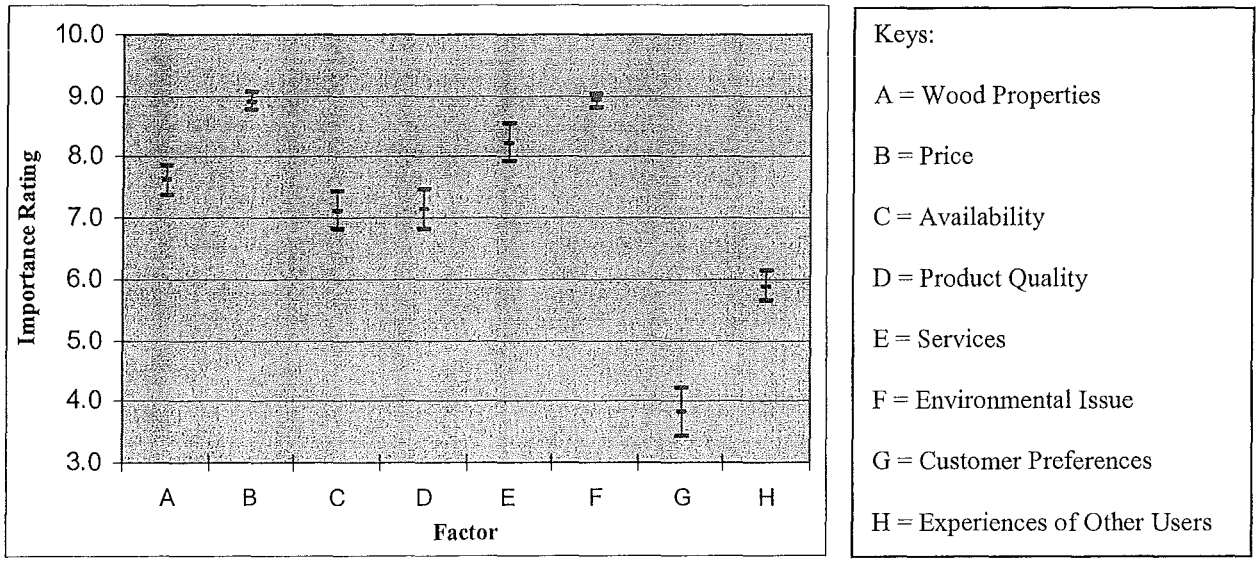


Figure 6.4 Furniture Sector: Furniture Manufacturers – The 95% Confidence Intervals: Importance Rating with Respect to the Eight Determinant Factors.



6.2.2 Organisational Characteristic

The industrial consumer's consumption behaviour can be segmented by different organisational characteristics, such as end-use markets and company size (Rao & Steckel, 1998). Sun *et al.* (1999) suggest that other organisational characteristics such as sector, ownership, annual turnover, and number of employees might also affect importance ratings given by the Chinese industrial wood consumers. This section will examine how these characteristics will influence the importance ratings given by the respondents. ANOVA and LSD tests were used to test the differences in importance ratings by characteristic at the 5% level.

Organisational Characteristic: Sector

Price and *Environmental Issues* are consistently ranked as the most and second most important factors respectively across different sectors. In contrast, the importance ratings are significantly different among different sectors with respect to *Wood Properties*, *Availability*, *Product Quality*, *Services*, *Customer Preferences*, and *Experiences of Other Users* (Table 6.2).

The importance ratings in Figure 6.1, Figure 6.2, Figure 6.3, and Figure 6.4 only show the relative importance ratings within each sector while Table 6.2 shows the difference in importance rating among sectors. However, these results cannot provide any logical linkages to rank these differences. As a result, an alternative approach in Appendix 6.5 was used to summarise all these differences in Figure 6.5.

Table 6.2 The Differences in Mean Importance Ratings by Sector.

	DIFFERENCE IN MEAN IMPORTANCE RATINGS BY *SECTOR*	*Difference between means*	*ANOVA P-value*
A	**Wood Properties**		0.0286
	Housing construction (wood processors) > Interior decoration sector	0.7	
	Housing construction (wood processors) > Furniture sector	0.9	
B	**Price**		0.4660
	None	-	
C	**Availability**		0.0174
	Housing construction contractors > Interior decoration sector	1.1	
	Housing construction contractors > Furniture sector	1.1	
D	**Product Quality**		0.0479
	Interior decoration sector > Housing construction contractors	0.7	
	Interior decoration sector >Furniture sector	0.9	
E	**Services**		0.0174
	Interior decoration sector > Housing construction contractors	0.6	
	Interior decoration sector > Furniture sector	0.6	
F	**Environmental Issues**		0.5294
	None	-	
G	**Customer Preferences**		0.0117
	Housing construction (wood processors) > Housing construction contractors	1.4	
	Housing construction (wood processors) >Interior decoration sector	1.5	
	Housing construction (wood processors) > Furniture sector	1.8	
H	**Experiences of Other Users**		0.0017
	Furniture sector > Interior decoration sector	0.8	
	Furniture sector > Housing construction (wood processors)	0.9	

Note: The number of respondents in each sector is described as follows:

Housing construction: *wood processors*	$n = 7$
Housing construction contractors	$n = 12$
Interior decoration sector	$n = 36$
Furniture sector	$n = 52$

Figure 6.5 The Relative Important Rating of the Eight Determinant Factors by Sector.[106]

	Housing Construction Sector			
	Wood Processors	Construction Contractors	Interior Decoration Sector	Furniture Sector
Most Important Factor				
9 -	B	B	B	B
	F	F	EF	F
	AE	ACE	D	E
8 -			A	A
	CD	D	C	CD
7 -				
6 -				H
5 -	H	H	H	
	G			
4 -		G	G	G
.				
.				
.				
Least Important Factor				
1 -				

Price (B) and Environmental Issues (F)

All the differences in importance ranking within each sector (Figure 6.1, Figure 6.2, Figure 6.3, and Figure 6.4) and different sectors (Table 6.2) are summarised in Figure 6.5. It shows that *Price* and *Environmental Issues* were consistently ranked as the most and second most important factors respectively among different sectors.

The results with respect to *Price* are very similar to the results in Sun *et al.* (1999) where *Price* was ranked as the most important factor in the decision-making process to adopt a new hardwood supply of the Chinese furniture manufacturers.

[106] Keys: A = Wood Properties; B = Price; C = Availability; D = Product Quality; E = Services; F. Environmental Issues; G = Customer Preferences; H = Experiences of Other Users.

Sun *et al.* (1999) show that "sustainability" was ranked as the least important factor in the decision-making process to use a new hardwood product for furniture manufacturers. In contrast, this study shows that *Environmental Issues* was the second most important factor which will influence industrial wood consumers to adopt a new wood product.

The recent changes of provincial government policy in Guangdong[107] encourage the housing construction and interior decoration sectors to use environmentally friendly products.[108] The changes require developers to consider environmental issues in their development plans. Consequently, construction contractors tendering for contracts from developers are also subjected to environmental constraints. As a result, more construction contractors require their wood products suppliers (wood processors) to supply "environmental friendly products". Moreover, many developers are now selling turnkey housing units instead of selling unfinished housing units, and sub-contractors in the interior decoration sector tendering for interior decoration projects are also subject to environmental constraints. As a result, interior decoration manufacturers have become more concerned about *Environmental Issues*.

For furniture manufacturers, rising environmentalism in both domestic and overseas markets has driven furniture manufacturers to use certified wood products. Although the results in this study indicates that the respondents' consumption behaviour has been slightly different compared to the results described in Sun *et al.* (1999), most respondents state that *Price* is still the most important factor. Based on anecdotal information obtained during the survey, the respondents indicated that they will use certified wood products only if both certified and non-certified products are at comparable prices.

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[107] Various Industrial Sources. The motivation of the policy changes is to reduce the amount of waste, and discourage illegal harvests from the natural forests, and create an environmental friendly image of the cities in Guangdong province.

[108] The definition of "Environmental Friendly Products" in China includes sustainability, health and safety, ability to recycle, and product duration.

Wood Properties, *Availability*, *Product Quality*, and *Services* ranked closely after *Price* and *Environmental Issues* (Figure 6.5). The rating of these determinant factors depends on different sectors.

Services (E)

The interior decoration sector rated *Services* as a relatively more important factor in comparison to other sectors. Most interior decoration material manufacturers mentioned that they have to provide credit to wholesalers, retailers, and interior decoration sub-contractors. They usually do not receive cash until their goods are sold, or until interior decoration sub-contractors receive their partial payments from developers or property owners. Unless they have overseas orders, they are unlikely to get any financial assistance from banks. Hence, they are more concerned with financial services compared with other services such as delivery time or technical assistance.

Wood Properties (A)

Wood processors and the construction contractors in the housing construction sector rated *Wood Properties* as a relatively more important factor than the interior decoration and furniture sectors. *Wood Properties* is an important factor that will influence the wood processors and construction contractors to adopt a new wood product, even when wood products are used for temporary housing construction. For instance, load testing is still required for wood products used for formwork in high-rise buildings.

Despite the interior decoration and furniture sectors rating *Wood Properties* as a relatively less important factor than the housing construction sector, they still rated it ranging from 7 to 9. Many respondents from the flooring and solid wood furniture manufactures indicated that *Wood* Properties, in terms of density and surface smoothness, are important issues that will influence them to adopt a new wood product.

Availability (C)

The construction contractors rated *Availability* as a relatively more important factor in comparison to other sectors. One reason is that construction contractors have to sign contracts with the developers, and contractors must follow the schedules stated in their contracts. Construction contractors often require a larger volume of wood products that alternative sources of supply may not meet. The situation would be even worse if several large scale construction projects simultaneously started during the same period, or if many projects are delayed after wet weather.

The exporters in the interior decoration and furniture sectors have to deliver their orders on a specified delivery date. Meeting these shipment schedules is important for the interior decoration and furniture sectors. However, the volume required is relatively small in comparison to the housing construction sector (Table 6.11). Most often they can find other alternative sources of supply from wholesalers or other nearby manufacturers. As a result, respondents from the interior decoration and furniture sectors rated *Availability* as a relatively less important factor than the housing construction sector.

Product Quality (D)

The interior decoration sector rated *Product Quality* as a relatively more important factor in comparison to other sectors. One of the reasons is that many respondents in the interior decoration sector produce flooring and mouldings. Flooring manufacturers require wood products to be more precise for continuous processing while mouldings manufacturers most often require certain clear lengths for doorframes and skirting manufacture.

The furniture sector was also thought to be more concerned about *Product Quality*. However, results in Figure 6.5 do not support this hypothesis. Although many furniture manufacturers state that they do not accept knotty wood products, they only require one or two clear faces and they can manually remove the knots and finger joint the clear sections. However, many furniture manufacturers indicate that *Product Quality* with respect to moisture content is the most important factor that will influence them to adopt a new wood product because they do not have their own kiln drying facilities.

Experiences of Other Users (H)

While most respondents ranked *Experiences of Other Users* as the second least important factor, the furniture sector rated *Experiences of Other Users* as relatively more important in comparison to other sectors. Many furniture manufacturers indicated that furniture is a consumable good in China, where the styles and timber species preferences are changing from time to time. Consequently, furniture manufacturers have to follow these trends in order to keep their businesses operating. They have to work with various species from tropical hardwoods to European beech to temperate hardwood and pine. "*Experiences of Other Users*" is relatively important for furniture manufacturers than other respondents because they are likely to use many different timber species. Therefore, they rated *Experiences of Other Users* as a relatively more important than other sectors.

Customer Preferences (G)

It is surprising that most respondents ranked *Customer Preferences* as the least important factor. Wood processors in the housing sector rated *Customer Preferences* as a relatively more important factor than other sectors. One explanation is that most of these wood processors are targeting domestic construction contractors, and they tend to develop a closer relationship with their customers than other sectors.

Construction contractors also target the domestic market, but they did not rate *Customer Preferences* as relatively more important than other sectors. One reason is that most of their wood products are used for temporary construction. As long as the construction contractors can complete their jobs in terms of time and specification according to the contracts, the developers are unlikely to influence the materials used by contractors, except where developers stated the materials in the contracts.

Most of the respondents from the interior decoration and furniture sectors consistently ranked *Customer Preferences* as the least important factor. One explanation is that most of these manufacturers are not directly communicating with their customers. They are imitating the most popular goods from the markets. If their goods can be sold quickly, they will produce more; otherwise, they will imitate other styles from the markets to generate more sales.

Organisational Characteristic: Ownership

Sun *et al.* (1999) suggest that the importance rankings of the industrial wood consumers might depend on other different organisational characteristics such as ownership. In this study, four types of distinctive ownerships were defined, and they are described in Chapter 2. The number of respondents by ownership and sector is summarised in Table 6.3. It shows that most wood processors are under share or joint venture ownership, and majority of the

construction contractors are co-operatively owned. Most respondents from the interior decoration and furniture sectors are under private ownership, there is also a significant proportion of respondents owned under a joint venture arrangement.

Table 6.3 Number of Respondents by Ownership and Sector.

		Sector				Total
		Housing Construction		*Interior decoration*	*Furniture*	
		Wood Processor	*Construction Contractor*			
Ownership	*Private*	0	2	22	37	61
	Co-operative	0	9	2	1	12
	Share	4	1	3	8	16
	Joint Venture	3	0	9	6	18
Total		7	12	36	52	107

Table 6.4 shows that importance ratings depend on the ownership characteristics of the industrial wood consumers in the interior decoration sector. Due to the effect of small sample size and different number of replicates in each cell (by sector and ownership), most of these differences are not significant in the housing construction sector.

The interior decoration materials manufacturers under a co-operative ownership ranked *Wood Properties* as a relatively more important factor than under a joint venture ownership. Moreover, they rated *Environmental Issues* as a relatively less important factor than under a joint venture ownership. In addition, interior decoration materials manufacturers under a share ownership rated *Product Quality* as a relatively less important factor than under a joint venture or private ownership. One explanation is that most interior decoration material manufacturers owned under co-operative and share ownership were originated from state owned enterprises (SOEs) prior to privatisation. These SOEs were used to producing goods for the domestic market, and they produce goods without the concerns of the needs and wants from customers (USDA, 2001b). As a result, they rated *Product Quality* and *Environmental Issues* as relatively less important factors than other ownerships.

Table 6.4 The Differences in Importance Ratings by Ownership.

DIFFERENCES IN MEAN IMPORTANCE RATINGS BY OWNERSHIP AND SECTOR		*Difference between means*	*ANOVA P-value*
A	**Wood Properties**		0.4561
B	**Price**		-
C	**Availability**		0.9269
D	**Product Quality**		0.7155
E	**Services**		0.4449
F	**Environmental Issues**		0.5067
G	**Customer Preferences**		0.0779
	Joint Venture > Share	3.2	< 0.0500
H	**Experiences of Other Users**		0.7968
A	**Wood Properties**		0.3197
B	**Price**		0.7599
C	**Availability**		0.2415
D	**Product Quality**		0.0339
	Share >Co-operative	2.3	< 0.0500
E	**Services**		0.2415
F	**Environmental Issues**		0.7599
G	**Customer Preferences**		0.3725
H	**Experiences of Other Users**		0.1839
A	**Wood Properties**		0.0494
	Co-operative > Private	1.2	< 0.0500
	Co-operative > Joint Venture	1.5	< 0.0500
B	**Price**		-
C	**Availability**		0.7678
D	**Product Quality**		0.0562
	Joint Venture > Share	2.5	< 0.0500
	Private > Share	1.9	< 0.0500
E	**Services**		0.8924
F	**Environmental Issues**		0.0025
	Share > Co-operative	1.5	< 0.0500
	Joint Venture > Co-operative	1.5	< 0.0500
	Private > Co-operative	1.4	< 0.0500
G	**Customer Preferences**		0.6890
H	**Experiences of Other Users**		0.4497
A	**Wood Properties**		0.3835
B	**Price**		0.6914
C	**Availability**		0.7613
D	**Product Quality**		0.8031
E	**Services**		0.7278
F	**Environmental Issues**		0.8721
G	**Customer Preferences**		0.4584
H	**Experiences of Other Users**		0.4858

Organisational Characteristic: Annual Turnover and Number of Employees

The importance ratings given by respondents are not influenced by annual turnover and number of employees. The results of the differences in importance ratings by annual turnover and number of employees are summarised in Appendix 6.6 and Appendix 6.7 respectively. Despite Sun *et al.* (1999) suggest that there is some evidence that the different levels of annual turnover would influence the importance rankings given by the furniture manufacturers to adopt a new hardwood product, this study failed to do so even though both studies used the same attributes (*same annual turnover ranges).* Again, small sample size and the wide variations in the number of sample size in each replicate are likely to contribute to the lack of significance (Table 6.5 and Table 6.6).

Table 6.5 The Number of Respondents by Different Levels of Annual Turnover in 2001 and Sector.

Annual Turnover in RMB¥ in 2001	**Sector**				**Total**
	Housing Construction		*Interior decoration*	*Furniture*	
	Wood Processors	*Construction Contractors*			
Less than **RMB¥** *10 million*	0	0	13	9	**22**
Between **RMB¥** *10 to 50 million*	2	0	16	31	**49**
More than **RMB¥** *50 million*	5	12	6	11	**34**
Total	**7**	**12**	**35**	**51**	**105**

Table 6.6 The Number of Respondents by Different Number of Employees in 2001 and Sector.

Number of Employees in 2001	**Sector**				**Total**
	Housing Construction		*Interior Decoration*	*Furniture*	
	Wood Processor	*Construction Contractor*			
Less than 30 employees	0	0	3	0	**3**
Between 30 to 100 employees	2	0	19	36	**57**
More than 100 employees	5	12	13	10	**40**
Total	**7**	**12**	**35**	**46**	**100**

Organisational Characteristic: Technology

Sun *et al.* (1999) used annual turnover to determine the respondents' technology level and concluded that the furniture manufacturers' technologies would influence the importance ranking given by the respondents. Varian (1999) defines that technology is a function of capital, labour, and raw materials whereas Sun *et al.* (1999) only examined the capital component through annual turnover. In order to incorporate the labour component into the technology function, the different combinations (K_iL_j), by combining annual turnover (K_i) and number of employees (L_j), were used to examine how the importance rating will be influenced by respondents' technology levels.

The differences in importance ratings are only statistically significant in the interior decoration and furniture sectors (Appendix 6.8). Unfortunately, these results cannot be confirmed because the sample violates ANOVA assumptions (Table 6.7) that variances among different groups (replicates) are assumed equal (Zar, 1999). Indeed, sample size in this study varies in many categories, and many (K_iL_j) categories have recorded zero respondents. Therefore, this study cannot conclude whether the importance ratings given by the respondents are significantly different.

Table 6.7 The Number of Respondent with Respect to Different Combinations of K_iL_j by Sector.

K_iL_j	Sector				Total
	Housing Construction		*Interior decoration*	*Furniture*	
	Wood Processor	*Construction Contractor*			
K_1L_1	0	0	3	0	**3**
K_1L_2	0	0	10	9	**19**
K_2L_2	2	0	10	26	**38**
K_2L_3	0	0	6	4	**10**
K_3L_3	5	10	6	12	**33**
Total	**7**	**10**	**35**	**51**	**103**

6.3 STAKEHOLDERS IN THE DECISION-MAKING PROCESS

The stakeholders involved in the decision-making process to adopt a new wood product in China are not well known by the New Zealand forestry sector. Respondents were asked to identify the stakeholders who are involved in the decision-making process to adopt a new wood product. Stakeholders can be divided into two groups: influencers and final decision-makers. **Influencers** refer to the stakeholders who are involved during the decision-making process, whereas **final decision-makers** refer to the stakeholders who are involved in the final decision-making process.

Housing Construction Sector: Wood Processors & Construction Contractors

For wood processors, the majority of the respondents state that the **general manager**, **director**, and **plant manager** were the final decision-makers in adopting a new wood product (Table 6.7). Meanwhile, a majority of the respondents state that the **director** was the influencer.

For the construction contractors, the majority of the respondents state that the **general manager** was the final decision-maker to adopt a new wood product (Table 6.8). Only a small proportion of the respondents state that the **purchasing manager** is the final decision-maker. Table 6.8 shows that influencers include **architect**, **engineer**, **carpentry contractor**, **general manager**, **purchasing manager**, and **director**. More influencers are involved among the construction contractors than in other sectors.

Table 6.7 Housing Construction Sector (*Wood Processors*): *The stakeholders who are involved in the decision-making process to adopt a new wood product.*

Wood Processors	Final decision-maker		Influencer	
Stakeholders	Number of respondents	(%)	Number of respondents	(%)
General Manager	2	29%		
General Manager & Director	1	14%	1	14%
General Manager & Plant Manager	1	14%		
Director	1	14%	4	57%
Plant Manager	2	29%	2	29%
Total Number of Respondents	**7**	**100%**	**7**	**100%**

Table 6.8 Housing Construction Sector (*Housing Construction Contractor*): *The stakeholders who are involved in the decision-making process to adopt a new wood product.*

Housing Construction Contractors	Final Decision-Maker(s)		Intermediate Decision-Maker(s)	
Stakeholders	Number of respondents	(%)	Number of respondents	(%)
Architect and Engineer			2	17%
Carpentry Contractor			1	8%
Developer & Engineer			2	17%
Engineer			1	8%
General Manager	8	68%	1	8%
General Manager & Carpentry Contractor			1	8%
General Manager & Purchasing Manager	2	17%		0%
Director			1	8%
Purchasing Manager	2	17%	3	25%
Total Number of Respondents	**12**		**12**	

Interior Decoration Sector: Interior Decoration Material Manufacturers

In the interior decoration sector, the majority of the respondents state that the **plant manager** was the final decision-maker (Table 6.9). A proportion of the respondents state that the **general manager** was the final decision-maker. Meanwhile, a majority of the respondents state that the **general manager** was the main influencer during the decision-making process. Only a small proportion of the respondents state that the **designer**, **engineer**, **director**, and **plant manger** were the influencers.

Furniture Sector: Furniture Manufacturers

In the furniture sector, the majority of the respondents state that the **general manager** and **plant manager** are the final decision-makers (Table 6.10). A small proportion of the respondents state that the **purchasing manager** was also the final decision-maker. A majority of the respondents state that the **general manager** and **director** are influencers during the decision-making process. Only a small proportion of the respondents state that the **plant manager** and **purchasing manager** are the influencers during the decision-making process.

Table 6.9 Interior Decoration Sector (*Interior Decoration Materials Manufacturers*): *The stakeholders who are involved in the decision-making process to adopt a new wood product.*

Interior Decoration Materials Manufacturers	Final Decision-Maker(s)		Intermediate Decision-Maker(s)	
Stakeholders	Number of respondents	(%)	Number of respondents	(%)
Designer			1	3%
General Manager	10	31%	18	56%
General Manager & Designer			1	3%
General Manager & Engineer			1	3%
Director	1	3%	6	19%
Plant Manager	21	66%	5	16%
Total Number of Respondents:	**32**	**100%**	**32**	**100%**

Table 6.10 Furniture Sector (*Furniture Manufacturers*): ***The stakeholders who are involved in the decision-making process to adopt a new wood product.***

Furniture Manufacturers	Final Decision-Maker(s)		Intermediate Decision-Maker(s)	
Stakeholders	Number of respondents	(%)	Number of respondents	(%)
General Manager	24	46%	36	69%
General Manager & Director			3	6%
General Manager & Purchasing Manager	1	2%		
Director			8	15%
Plant Manager	19	37%	3	6%
Plant Manager & Purchasing Manager	3	6%		
Purchasing Manager	5	10%	2	4%
Total Number of Respondents:	**52**	**100%**	**52**	**100%**

6.4 WOOD CONSUMPTION BEHAVIOUR

The annual volume of wood, types of wood products used, and type of species used by respondents in 2001 were analysed.

6.4.1 Total Annual Volume Used in 2001

The average total volume of all wood products[109] used by respondents in 2001 is summarised in Table 6.11. The volume used by the wood processors is substantially higher than in other sectors while the construction contractors used slightly larger volumes than the interior decoration and furniture sectors.

Table 6.11 The Total Annual Volumes of All Wood Products (*in thousand m^3*) Used by Respondents in 2001.

SECTOR		Average	Standard deviation	Sample size (n)	*Minimum*	*Maximum*
Housing Construction	*Wood Processors*	170	112	7	45	360
	Construction Contractors	12	6	12	7	23
Interior Decoration		8	11	36	1	48
Furniture		5	3	52	1	18

6.4.2 Types of Wood Products Used in 2001

Wood Processors

Most wood processors in the housing construction sector used coniferous roundwood, followed by non-coniferous roundwood (Table 6.12). Only a small proportion of the respondents used both coniferous and non-coniferous sawn timber.

[109] Total annual wood volume used in 2001 is an estimation only without conversion to roundwood equivalent (*i.e. sawn timber is not converted into roundwood equivalent*).

Construction Contractors

The construction contractors in the housing construction sector used mainly coniferous plywood, and a substantial proportion of coniferous and non-coniferous sawn timber, and a small proportion of non-coniferous plywood in 2001 (Table 6.12).

Interior Decoration Sector: Interior Decoration Material Manufacturers

Most respondents in the interior decoration sector used non-coniferous sawn timber and MDF (Table 6.12). These respondents also used a proportion of coniferous and non-coniferous plywood.

Furniture Sector: Furniture Manufacturers

Most respondents in the furniture sector used coniferous and non-coniferous sawn timber, coniferous plywood, and particleboard (Table 6.12). These respondents also used a proportion of non-coniferous plywood.

Table 6.12 Mean Percentage of Total Volume of Wood Used in 2001 by Type of Wood Product: Housing Construction Sector (*Wood Processors and Construction Contractors*), Interior Decoration Sector (*Interior Decoration Materials Manufacturers*), and Furniture Sector (*Furniture Manufacturers*).

(Mean in %)	*Wood Processors* (n = 7)	*Construction Contractors* (n = 12)	*Interior Decoration Materials Manufacturers* (n = 36)	*Furniture Manufacturers* (n = 52)
Coniferous logs	53	1	25	0
Coniferous sawn timber	2	24	7	19
Coniferous veneer	0	0	0	0
Coniferous plywood	1	43	14	15
Particleboard	0	0	3	14
Non-coniferous logs	22	1	5	2
Non-coniferous sawn timber	2	24	27	40
Non-coniferous veneers	19	0	3	1
Non-coniferous plywood	0	6	12	6
Fibreboard (MDF)	1	1	4	3

6.4.3 Timber Species Used in 2001

Most respondents describe that they used various species in 2001. The mean percentage of total annual volume used by respondents for each species is summarised in Table 6.13. Respondents were randomly chosen from the trade shows in Guangzhou and Hong Kong. They were mostly chosen from nearby areas. Based on anecdotal information obtained during the survey, the use of *Pinus radiata* in Guangzhou would be relatively higher than in other provinces because of cheaper transportation cost and plywood manufacturers are more concentrated in Guangzhou province.

American: Red Oak, White Oak, and Walnut

None of the respondents used any American red oak, white oak, or walnut wood products in 2001. Only a very small proportion of the respondents used Chinese red oak and chestnut, and none of the respondents mentioned that they used Chinese white oak during 2001.

Domestic Timber Species

Many respondents in the housing construction, interior decoration, and furniture sectors used unknown domestic timber species and Chinese birch in 2001.

European Beech

The most common species used was European beech, the mean percentage varying from 3% in the housing construction sector to 17% in the interior decoration sector and 13% in the furniture sector.

Despite USDA (2002) indicating that the domestic market has been switching from European beech to other temperate hardwood species, many respondents in the interior decoration and furniture sector stated that they still used a large proportion of European beech in 2001.

Table 6.13 The Estimated Percentage of Different Timber Species of the Total Volume Used in 2001.

SECTOR	Housing Construction		Interior Decoration		Furniture	
SPECIES	% of respondents	Mean (in %)	% of respondents	Mean (in %)	% of respondents	Mean (in %)
American red oak	0%	0	0%	0	0%	0
American white oak	0%	0	0%	0	0%	0
American walnut	0%	0	0%	0	0%	0
Chinese unspecified species	79%	7	58%	18	98%	10
Chinese birch	63%	1	69%	4	54%	3
Chinese fir	0%	0	0%	0	0%	0
Chinese red oak	0%	0	3%	0	2%	0
Chinese white oak	0%	0	0%	0	0%	0
Chinese walnut	0%	0	3%	0	0%	0
Douglas-fir	0%	0	0%	0	0%	0
Eucalyptus	0%	0	0%	0	0%	0
European Beach	58%	3	89%	17	87%	10
Hemlock – Pacific Coast	0%	0	0%	0	0%	0
Hemlock – Western	0%	0	6%	0	0%	0
Mahogany	0%	0	36%	3	19%	1
Pine- Maritime	0%	0	0%	0	0%	0
Pine – New Zealand	32%	13	3%	1	8%	2
Pine – radiata (non-specified origin)	84%	41	53%	34	87%	20
Pine – ponderosa	0%	0	0%	0	0%	0
Pine – Southern yellow	0%	0	0%	0	0%	0
Russian coniferous	63%	15	0%	0	0%	0
Popular	0%	0	0%	0	0%	0
Rosewood	0%	0	6%	0	54%	4
Rubberwood	0%	0	28%	2	73%	9
Spruce - Sitika	0%	0	0%	0	0%	0
Teak	0%	0	22%	1	8%	0
Plywood	58%	4	83%	19	98%	34
Particleboard	5%	1	11%	1	13%	1
MDF (medium density fibreboard)	68%	15	36%	3	73%	6

Western Hemlock & Mahogany

Not many respondents used Western hemlock in 2001, except some in the interior decoration sector. In addition, only a small proportion of respondents in the interior decoration and furniture sectors used mahogany in 2001.

Pinus radiata (New Zealand Pine)

Many respondents used *P. radiata* wood products in 2001. However, only a small proportion of the respondents could identify that the wood product's origin is from New Zealand. Many consumers of wood-based panel products indicated that they do not care too much about the origins.

A section in the questionnaires was designed to examine respondents' knowledge and preferences in relation to New Zealand pine. Most respondents, however, failed to complete this section. As a result, no conclusion could be drawn regarding their knowledge and preferences on New Zealand pine.

Russian Coniferous

In the housing construction sector, some respondents indicate that they used a substantial volume of Russian coniferous wood products whereas none of the respondents in the interior decoration and furniture sectors used Russian coniferous wood products from this source. Because most respondents are from Guangzhou or nearby areas in this survey, the use of Russian coniferous is not as popular as in northern China.

Rosewood & Rubberwood

A small proportion of the respondents in the furniture sector used rosewood with mean percentage of 4%.

More than two-thirds of the furniture manufacturers used rubberwood with mean percentage of 9%. It may be due to the success of Malaysia recently promoting rubberwood as "Malaysian Oak" (Neilson, 2002), resulting in none of the respondents using any American oak in 2001.

Wood-Based Panel Products

Surprisingly, many respondents could not identify the timber species or origins of their wood-based panel products because many wood-based panel products are made from many different timber species and cannot be identified. Respondents completed the questionnaires by providing the types of wood-based panels only.

6.5 DISTRIBUTION CHANNELS

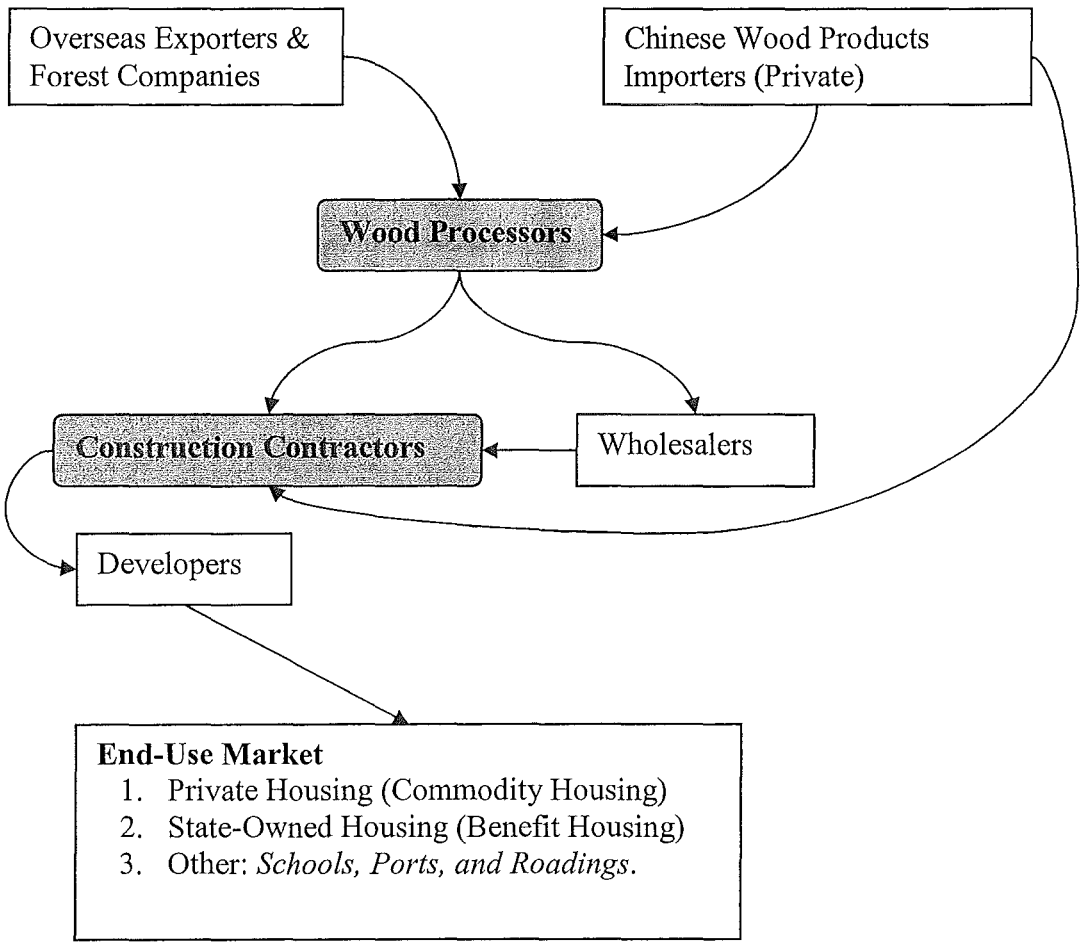
Li (1997) and Hammett & Sun (1997) describe the distribution channels for wood products before the deregulation of the wood products in the mid 1990s. They describe that the distribution channels have changed due to the market deregulation, disestablishment of SOEs, and China's accession to the WTO. Respondents were asked to provide their importance ratings with respect to different distribution channels (from their sources of supply, through their customers, and end-use markets. The results are summarised in Figure 6.6, Figure 6.7, and Figure 6.8 for each sector.[110]

Most respondents indicate that their sources of supply are now not from SOEs, and they have diversified their sources of supply from overseas exporters to Chinese importers (private) and domestic wholesalers. However, most respondents indicate that Chinese importers are the most preferred source of supplier rather than from the overseas exporters and domestic wholesalers. Most respondents describe that language barriers with overseas suppliers is only a minor issue. Chinese importers are favoured because they can provide the financial services and prepare all the import documentation.

[110] The raw data from the survey are shown in Appendix 6.9, Appendix 6.10, Appendix 6.11, and Appendix 6.12. Only channels indicated as the first and second most importance rankings with more than 10% respondents selected are displayed in Figure 6.6, Figure 6.7, and Figure 6.8.

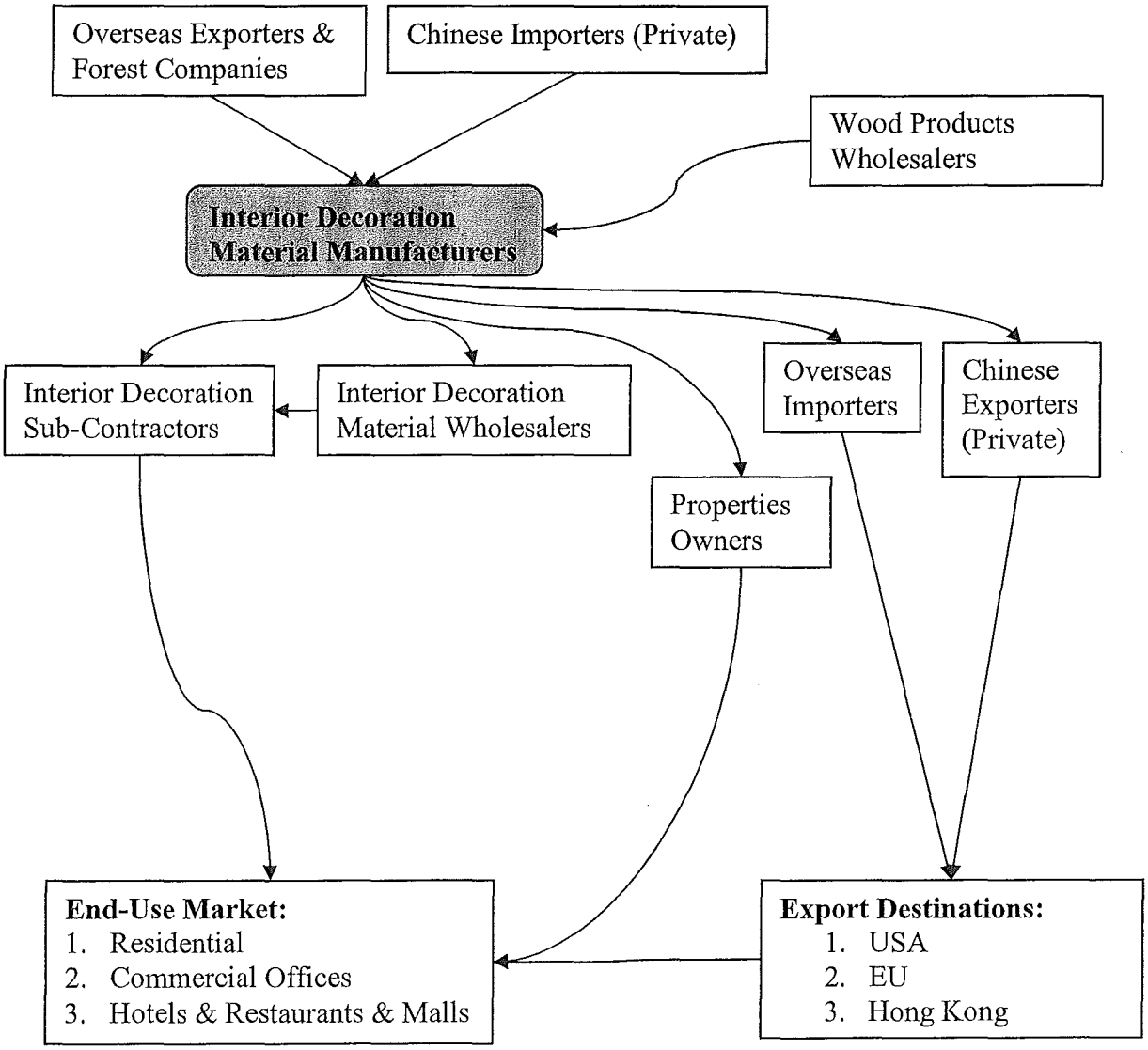
About one-third of the interior decoration material manufacturers indicate that property owners who purchase wood products directly from them are their most important customers. Hence, there might be some potential for the do-it-yourself (DIY) market despite most consumers buying directly from clustered manufacturers or wholesalers, and not from DIY home centres in Shanghai or Beijing (Longo & Gonzalea, 2000).

Figure 6.6 Housing Construction Sector: Distribution Channels and End-Use Market.[111]



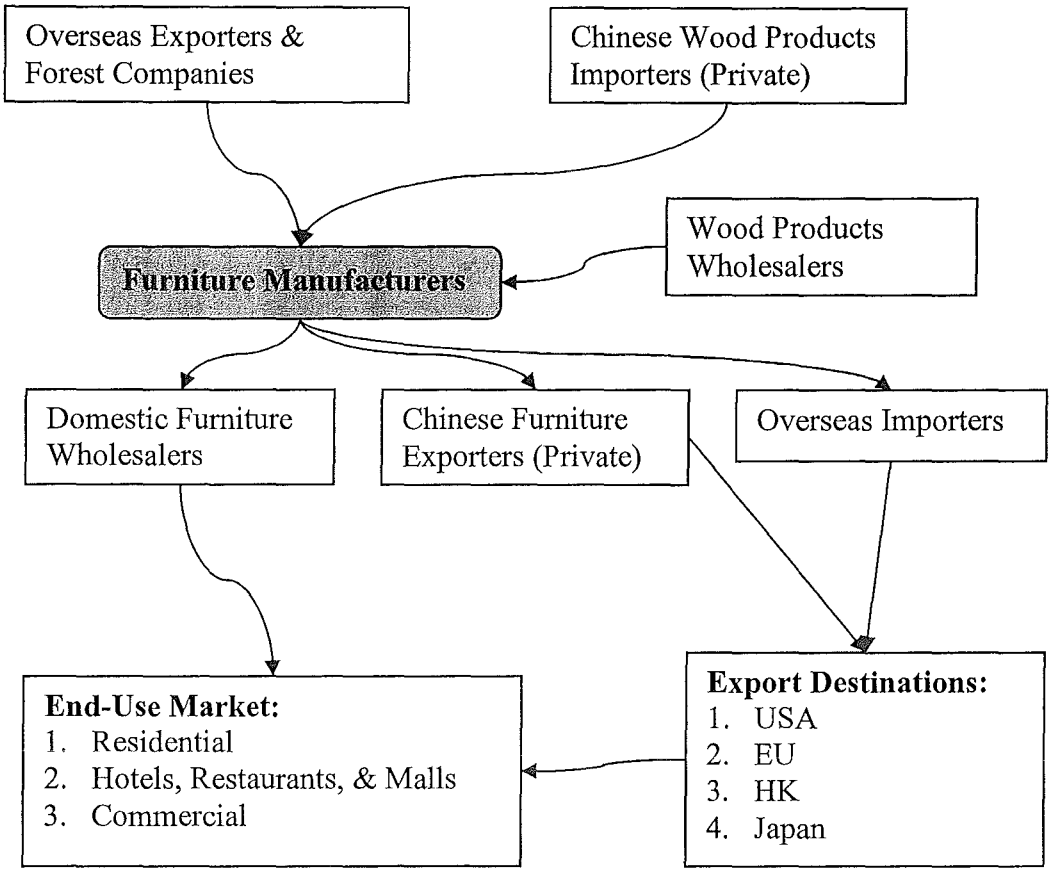
[111] Linkages only show when there are more than 10% of the respondent specified that linkages as the most important linkages in Appendix 6.9 and Appendix 6.10.

Figure 6.7 Interior Decoration Sector: Distribution Channels and End-Use Market.[112]



[112] Linkages only show when there are more than 10% of the respondent specified that linkages as the most important linkages in Appendix 6.11.

Figure 6.8 Furniture Sector: Distribution Channels and End-Use Market.[113]



6.6 CHAPTER SUMMARY

Industrial wood consumers (*wood processors and construction contractors in the housing construction sector, interior decoration material manufacturers in the interior decoration sector, furniture manufacturers in the furniture sector*) were examined in this chapter. The recent import deregulation, logging ban, and rising environmentalism in consumer markets appear to have changed the decision criteria of the Chinese industrial wood consumers.

[113] Linkages only show when there are more than 10% of the respondent specified that linkages as the most important linkages in Appendix 6.12.

Most Important Factor: Price & Environmental Issues

Price continues to be the most important factor that will influence industrial wood consumers to adopt a new wood product. This result was also determined by Sun *et al.* (1999). *Environmental Issue* has become the second most important factor whereas Sun *et al.* (1999) found it to be unimportant.

Surprisingly, most respondents consistently ranked *Customer Preferences* as the least important factor. It can be concluded that the relationship between industrial wood consumers and their customers is weak. Industrial wood consumers (producers) tend to be sales focused and using sales revenue as their market indicator.

Importance Rating by Different Organisation Characteristics

Importance ratings were influenced by different organisational characteristics such as different sectors and ownerships according to Sun *et al.* (1999). This study cannot conclude whether organisational characteristics (*annual turnover* and *number of employees*) will influence the importance ranking. Small sample size and the widely variations in the number of sample size in each replicate limit what can be concluded from this study.

According to Sun *et al.* (1999), technology level would influence the importance ratings given by industrial wood consumers. However, small sample size and the unevenly distributed variances among different groups (replicates) are likely to mislead the results in this study.

Stakeholders in Final Decision-Making

In terms of stakeholders, most respondents indicate that the general manager was the final decision-maker in adopting a new wood product in the housing construction sector (with many other intermediate decision-makerse) whereas the plant manager was the final

decision-maker in the interior decoration sector. In the furniture sector, most respondents indicated that both the general manager and the plant manager were the final decision-makers.

Wood Consumption Behaviour

Industrial wood consumers' consumption behaviour varies among different sectors. The housing construction sector used a relatively larger "volume of wood" than other sectors.[114] It is also the only sector that is using a substantial volume of Russian coniferous species. In contrast, the interior decoration and furniture sectors used many different timber species ranging from tropical hardwood, temperate hardwood, pine, and other coniferous as well as unspecified domestic timber species.

On average, *P. radiata* accounted for more than half of the annual volume used by wood processors and construction contractors in the housing construction sector, and accounted for one-third of the annual volume used by the interior decoration and furniture sectors. However, many respondents could not identify, whether or not, their sources of supply are from New Zealand. Further research should be taken to compare the position of New Zealand pine against other *P. radiata* suppliers.

The word "pine" in Chinese refers to many coniferous species. For example, Russian spruce is also translated as "Russian Pine" in the Chinese wood products market. New Zealand exporters should rethink the use of "New Zealand Pine" for branding its *P. radiata*. For example, Malaysia has successfully branded its rubberwood as "Malaysian Oak" and it seems to be widely used by the Chinese furniture industry to replace American oak.

[114] "Volume of Wood" refers to all the annual volume used of all wood products in 2001 without converting the volume into roundwood equivalent.

Distribution Channels

The distribution channels from sources of supply through customers to end-use markets are more diverse than the distribution channels described in Li (1997) and Hammett & Sun (1997). However, many respondents indicate that they prefer to use Chinese importers (private) rather than overseas exporters, overseas forest companies, or wholesalers as a source of supply because Chinese importers tend to provide financial services and prepare most of the documentation for the industrial wood consumers.

Summary

Price is still the most important factor for the New Zealand forestry sector to promote New Zealand wood products in the Chinese wood products market. The rising environmentalism in the domestic and export markets has driven industrial wood consumers to use more "environmental friendly wood products". This provides an opportunity for New Zealand to differentiate its products from other *P. radiata* suppliers.

In this chapter, the microenvironmental drivers of these industrial wood consumers have been discussed. Kotler and Armstrong (1999) describe that other macroenvironmental drivers would highly influence the long-term demand of industrial markets. Real gross domestic product (real GDP) of a nation is the most important macroenvironmental driver of wood consumption (Buongiorno *et al.*, 2001; & Solberg, 1996). These macroenvironmental drivers will be examined in Chapter 7 and Chapter 8.

Chapter 7 INCOME ELASTICITY OF DEMAND

China's real GDP (in 1999 prices) has increased by an average of 10% per annum between 1990 and 2000 (Asian Demographics Limited, 2001). The estimation of income elasticity would be useful to examine the likely changes of the Chinese wood consumption with respect to future changes in real GDP. The purpose of this chapter is to estimate the income elasticities of selected wood products (*all industrial roundwood*, *coniferous roundwood*, *non-coniferous roundwood*, *all sawnwood*, *coniferous sawnwood*, *non-coniferous sawnwood*, *fibreboard*, *plywood*, *particleboard*, *veneer sheet*, and *all wood-based panels*) in China. In addition, as many analysts describe the Chinese industrial wood consumers are being price-conscious, the export and import price elasticities of these selected wood products will also be examined.

7.1 INTRODUCTION

Data Collection

The nominal GDP and real GDP per capita are summarised in Appendix 7.1. The real GDP per capita in RMB¥ (in 1999 prices) was used to represent the average income level per capita in China between 1987 and 2000. The apparent consumption per thousand capita, and real export and import prices from FAOSTAT are summarised in Appendix 7.2. A complete series of apparent consumption per thousand capita, average import and export prices for *industrial roundwood*, *coniferous roundwood*, *and non-coniferous roundwood* are not available between 1987 and 1990, and as a result, the number of observations in these wood products are slightly smaller than for other wood products.

Autocorrelation

Apart from *fibreboard* and *all wood-based panels*, the regressions for all other wood products were subjected to autocorrelation. Transformation according to Gujarati (1999) was used to mediate the regressions for autocorrelation. Because the first observation will be lost after the transformation, the results in Table 7.1 show that the number of observations is slightly different between different wood products.

Income & Price Elasticities: Selection Criteria

The constant income elasticity ($B1_i$), the real average export price elasticity ($B2_i$), and the real average import price elasticity ($B3_i$) are listed in Table 7.1. The export and import price elasticities are shown only if the coefficients were significant at the 5% level.

7.2 INCOME ELASTICITY ($B1_i$)

The income elasticity ($B1_i$) measures the percentage change in the apparent consumption per capita of a given wood product (i) for a 1% change in real GDP per capita. For example, the constant income elasticity ($B1$) of *plywood* is 1.2 as shown in Table 7.1, which represents that if the Chinese real GDP per capita increases by 1%, the apparent consumption of *plywood* per thousand capita would increase by 1.2% *ceteris paribus*. The 95% confidence interval of the income elasticity of *plywood* ranges between 0.91 and 1.49, which means there is 95% chance that the mean apparent consumption per thousand capita of *plywood* would increase between 0.91% and 1.49% if the Chinese real GDP increases by 1% *ceteris paribus*.

7.2.1 Solid Wood Products

The constant income elasticities ($B1_i$) in Table 7.1 show that the coefficients of all solid wood products[115] are not significantly greater than zero at the 5% level because the P-values are much greater than 5%. Hence, the income elasticities of all solid wood products are not significantly different from zero.

Therefore, it can be concluded that the income elasticities of all solid wood products (*all industrial roundwood, coniferous roundwood, non-coniferous roundwood, all sawnwood, coniferous sawnwood, non-coniferous sawnwood*) are not significantly greater than zero. The apparent consumption of all solid wood products per thousand capita will not necessarily increase if the Chinese real GDP per capita increases. Thus, the results in Table 7.1 cannot determine whether all these solid wood products in China are either normal or inferior goods.

7.2.2 Wood-Based Panel Products

In contrast, the constant income elasticities ($B1_i$) in Table 7.1 show that the coefficients of all wood-based panel products[116] are significantly greater than zero at the 5% level. The 95% confidence intervals of the constant income elasticities ($B1_i$) for all wood-based products do not include zero, which means the elasticities of all these wood-based products are significantly greater than zero.

Therefore, it can be concluded that the income elasticities of all wood-based panel products are significantly greater than zero by using the constant elasticity model at the 5% level *ceteris paribus*. Hence, the apparent consumption of all wood-based panel products *(fibreboard, plywood, particleboard, veneer sheet, and all wood-based panels)* will increase

[115] **Solid wood products** refer to *all industrial roundwood, coniferous roundwood, non-coniferous roundwood, all sawnwood, coniferous sawnwood, non-coniferous sawnwood.*

[116] **Wood-based products** refer to *fibreboard, plywood*, particleboard, veneer *sheet*, and *all wood-based panels.*

if the Chinese real GDP per capita increases. In addition, these wood-based products in China can be defined as normal goods as the apparent consumption per thousand capita will increase if the average income per capita increases.

7.2.3 Comparing Income Elasticity Among Different Wood Products

Table 7.1 shows that "*veneer sheet*" has the most elastic income elasticity, followed by *particleboard*, *all wood-based panels*, *fibreboard*, and *plywood*. Indeed, the 95% confidence intervals in Table 7.1 show that the income elasticities for all wood-based products are relatively the same because most of the 95% confidence intervals are overlapping.

"*Particleboard*" is the second most elastic wood products with respect to the real GDP per capita. However, the standard error of *particleboard* is relatively large in comparison to the other wood-based products in Table 7.1. In addition, the adjusted R^2 for *particleboard* is 0.47 (Table 7.1), which indicates that only 47% of the variation in the natural logarithm of apparent consumption per thousand capita of *particleboard* can be explained by the natural logarithm of the real GDP per capita. The adjusted R^2 is relatively small in comparison to other wood-based products.

As a result, in Table 7.1 we cannot ascertain which wood-based product is the most elastic with respect to real GDP per capita in the Chinese wood products market. However, it can be concluded that the consumption of all wood-based products would increase if the Chinese real GDP per capita increases.

This suggests that other factors are likely to influence the apparent consumption per thousand capita of *particleboard* in China. For example, substitution by fibreboard is likely to influence the apparent consumption of particleboard (Chapter 3). Furthermore, USDA (2001a) and USDA (2002b) describe the Chinese middle-class trend to use more solid wood and plywood furniture. This may also influence the apparent consumption of particleboard, and result in a low adjusted R^2 in compared to other wood-based panel products.

7.3 Real Average Export Price ($B2_i$)

The constant export price elasticity ($B2_i$) measures the percentage change in the apparent consumption per thousand capita of a given wood product (i) for a 1% change in the average nominal export price. Table 7.1 shows that none of the export price elasticities ($B2_i$) are significant at the 5% level.

This may be attributed to the fact that China is a wood deficit country where the deficit is estimated at 33 to 43 million m^3 of industrial roundwood between 2000 and 2010 (USDA, 2001b). As a result, most wood products are used to support the domestic manufacturing industries and exports.

Furthermore, Buongiorno *et al.* (2001) and Solberg (1996) commented that price has little influence on the apparent consumption of wood products in the international wood products market, especially industrial roundwood and sawnwood. Therefore, it can be concluded that the real average export price is unlikely to influence the apparent consumption in the Chinese wood products market.

Table 7.1 Income, Import Price, and Export Price Elasticity of Wood Product (*i*).

The Natural Logarithm of the Apparent Consumption per thousand capita of Wood Product *(i)* $In(C_{ij})$	Coefficients			P-Value			Adjusted R^2	Durbin-Watson Test (*d*)	Critical Value of Durbin-Watson Test	
	$B1_i$	$B2_i$	$B3_i$	$B1_i$	$B2_i$	$B3_i$			$(4 - d_L)$ & d_L	$(4 - d_U)$ & d_U
All industrial roundwood	0.06			0.325			0.01	1.41	(3.12) 0.88	(2.68) 1.32
Coniferous industrial roundwood	0.77			0.190			0.20	1.50	(3.12) 0.88	(2.68) 1.32
Non-coniferous industrial roundwood	0.05			0.413			0.09	1.54	(3.12) 0.88	(2.68) 1.32
All sawnwood	-0.30			0.227			0.13	1.35	(2.99) 1.01	(2.66) 1.34
Coniferous sawnwood	-0.40			0.202			0.07	1.48	(2.99) 1.01	(2.66) 1.34
Non-coniferous sawnwood	-0.14			0.427			-0.03	1.78	(2.99) 1.01	(2.66) 1.34
Fibreboard	1.23		-0.002	<0.001		0.011	0.97	2.16	(3.14) 0.86	(2.44) 1.56
Plywood	1.20			<0.001			0.86	1.73	(2.95) 1.05	(2.65) 1.35
Particleboard	1.49			0.006			0.47	1.76	(2.99) 1.01	(2.66) 1.34
Veneer Sheet	1.87			0.004			0.66	1.83	(2.99) 1.01	(2.66) 1.34
All wood-based panels	1.30			<0.001			0.92	1.63	(2.95) 1.05	(2.65) 1.35

	Standard Error			95% Confidence Interval						
				$B1_i$		$B2_i$		$B3_i$		
$In(C_{ij})$	$B1_i$	$B2_i$	$B3_i$	Lower	Upper	Lower	Upper	Lower	Upper	n_i
All industrial roundwood	0.02			0.014	0.106					10
Coniferous industrial roundwood	0.05			0.647	0.895					10
Non-coniferous industrial roundwood	0.06			-0.081	0.178					10
All sawnwood	0.23			-0.807	0.215					13
Coniferous sawnwood	0.29			-1.035	0.245					13
Non-coniferous sawnwood	0.17			-0.513	0.235					13
Fibreboard	0.07		0.0001	1.085	1.375			-0.003	-0.001	13
Plywood	0.13			0.912	1.488					14
Particleboard	0.44			0.522	2.458					13
Veneer Sheet	0.37			1.056	2.684					13
All wood-based panels	0.11			1.060	1.540					14

7.4 Real Average Import Price ($B3_i$)

The constant import price elasticity ($B3_i$) measures the percentage change in the apparent consumption per thousand capita of a given wood product *(i)* for a 1% change in the real average import price. For example, the constant import price elasticity ***(B3)*** of *fibreboard* is – 0.002 (Table 7.1), which indicates that if the real average import price of *fibreboard* increases by 1%, the apparent consumption of *fibreboard* per thousand capita will decrease by 0.002% *ceteris paribus*. The 95% confidence interval of the import price elasticity of *fibreboard* lies between -0.003 and -0.001, which means there is 95% chance that the mean import price elasticity of *fibreboard* will decrease from 0.001% to 0.003% if the real average import price of *fibreboard* increases by 1%.

In contrast, the real average import price does not significantly influence the apparent consumption of other selected wood products in China as the import price elasticities of most wood products are not statistically significant at the 5% level (Table 7.1).

The magnitude of the real import price elasticity of fibreboard is relatively small compared to the income elasticity. One of the reasons suggested by Buongiorno *et al.* (2001) and Solberg (1996) is that price has little influence on wood products consumption.

Another reason is that the domestic fibreboard industry cannot produce a specific type of fibreboard as can international fibreboard producers. As described earlier in Chapter 3, China trends to produce a lot of MDF and low-density fibreboard, and imports a significant volume of high-density fibreboard (HDF) from Germany. As domestic production cannot meet the domestic demand of HDF, the apparent consumption of fibreboard is unlikely to be lowered if the real average import price increases. As a result, the apparent consumption per thousand capita of fibreboard only shows a very small even though the real average import price increases by 1%.

7.5 THE ADJUSTED R^2

The adjusted R^2 for most wood products vary from –3% (in *non-coniferous sawnwood*) to 97% (in *fibreboard*). Solid wood products tend to have a very poor adjusted R^2 whereas wood-based panel products tend to have a very high adjusted R^2 (Table 7.1).

The magnitude of the adjusted R^2 obtained from this study is very similar to the adjusted R^2 obtained from Buongiorno *et al.* (2001); Zhang *et al.* (1997); and Solberg (1996), where the adjusted R^2 for industrial roundwood and sawnwood are very small in comparison to the wood-based products. Hence, most of the variation in these regression models of industrial roundwood and sawnwood cannot be explained by real GDP individually, whereas most of the variation in the regression models of most wood-based panel products can be explained by real GDP alone.

Buongiorno *et al.* (2001) and Solberg (1996) suggested that international trade of industrial roundwood and sawnwood is more likely to be influenced by economic, socio-demographic, political, technological, and environmental factors (but not price) rather than by GDP individually.

7.6 CHAPTER SUMMARY

In order to examine whether the income elasticities of the selected wood products are likely to follow trends in other international wood products, the income elasticities and 95% confidence intervals from other studies were examined. The income elasticities and 95% confidence intervals of selected wood products[117] in the international wood products market as determined by Buongiorno *et al.* (2001) are compared with those estimated for China in this study in Table 7.2.

[117] Buongiorno *et al.* (2001) have used "*other industrial roundwood*" instead of "*all industrial roundwood*"; "*all sawnwood* plus *sleepers*" instead of "*all sawnwood*"; and "*plywood* plus *veneer sheet*" instead of "plywood" and "*veneer sheet*" individually. All data were collected from FAOSTAT.

Wood-Based Panel Products

The income elasticities of *fibreboard, plywood, particleboard, and veneer sheet* are of a similar magnitude between both studies because the 95% confidence intervals are mostly overlapping (Table 7.2).

The 95% confidence intervals of *particleboard* and *veneer* sheet are slightly wider in this study because the standard errors of *particleboard* and *veneer sheet* are relatively higher than other wood products. Meanwhile, the standard error of *particleboard* was also the highest and poorest among all other wood-based products in Buongiorno *et al.* (2001).

It can be concluded that the apparent consumption per thousand capita of *fibreboard, plywood, particleboard, veneer sheet,* and *all wood-based panels* in China are likely to follow trends in the international wood products market.

Solid Wood Products

The income elasticities of *all industrial roundwood* from both studies are not significantly different from zero in both studies.[118] However, Table 7.2 shows that the income elasticity of *all sawnwood* in Buongiorno *et al.* (2001) is significantly greater than zero whereas it is not significantly greater than zero at the 5% levels in this study. One of the reasons is that wood framed houses only accounted for 0.06% of the total housing starts in China in 2001 (USDA, 2002) whereas wood framed houses account for a greater proportion of the total housing starts in many western countries and Japan (Peck, 2001).

Similarly, in Zhang *et al.* (1997) found that the long-term income elasticity of sawnwood in China is not significantly different from zero at the 5% level, which means the apparent

[118] Buongiorno *et al.* (2001) used 1% whereas this study used 5% as the significance level. In addition, Buongiorno *et al.* (2001) used *"other industrial roundwood"* and this study used *"all industrial roundwood"* from FAOSTAT.

consumption per capita is unlikely to be influenced by the increase in GDP per capita. Zhang *et al.* (1997) suggest that the apparent consumption of sawnwood in China was mainly influenced by population alone, and projected the future apparent consumption per capita would remain the same by 2010.

It cannot be concluded whether the apparent consumption of industrial roundwood will follow the trends in the international market. It can be concluded that the sawnwood market in China is unlikely to follow international trends. In contrast, it can be concluded that most wood-based panel products in China are likely to follow international trends, and the magnitude of these changes will be very similar as in the international wood products market.

Both studies found that the apparent consumption per thousand capita of *all industrial roundwood* and *all sawnwood* are less elastic than all wood-based products with respect to the changes in real GDP (Table 7.2).

Conclusion

The apparent consumption per thousand capita of most wood-based panel products[119] is likely to increase if the Chinese real GDP per capita increases. However, the apparent consumption per thousand capita of most solid wood products[120] is not clearly shown to change if the Chinese real GDP per capita increases.

The average price import and export elasticities are not statistically significant at the 5% level in this study (apart from *fibreboard*). Solberg (1996) suggests that there are other macroenvironmental drivers such as economic, policy, socio-demographic, and technological, and environmental drivers that are likely to influence the Chinese wood

[119] All wood-based panel products refer to *fibreboard, plywood,* particleboard, veneer *sheet,* and *all wood-based panel products.*

[120] All solid wood products refer to *all industrial roundwood, coniferous roundwood, non-coniferous roundwood, all sawnwood, coniferous sawnwood,* and *non-coniferous sawnwood.*

products market. These macroenvironmental drivers will be examined in Chapter 8.

Table 7.2 Income Elasticities of Selected Wood Products from Buongiorno *et al.* (2001).

The Natural Logarithm of the Apparent Consumption per thousand capita of Wood Product *(i)* $In(C_{ij})$	*Income Elasticity* [real GDP per capita (in 1999 prices)]				Income Elasticity Buongiorno *et al* (2001)[121]			
	Coefficient	P-Value	Standard Error	Adjusted R^2	Coefficient	P-Value	Standard Error	Adjusted R^2
	$B1_i$	$B1_i$	$B1_i$		BB_i	BB_i	BB_i	
All industrial roundwood	0.06	0.325	0.02	0.01	-0.07	≥0.01	0.09	0.00
Coniferous roundwood	0.77	0.190	0.05	0.20				
Non-coniferous industrial roundwood	0.05	0.413	0.06	0.09				
All sawnwood[122]	-0.30	0.227	0.23	0.13	0.85	≤0.01	0.07	0.47
*Coniferous sawnwood**	-0.40	0.202	0.29	0.07				
*Non-coniferous sawnwood**	-0.14	0.427	0.17	-0.03				
Fibreboard	1.23	<0.001	0.07	0.97	1.28	≤0.01	0.09	0.61
Plywood	1.20	<0.001	0.13	0.86	1.17	≤0.01	0.08	0.61
Particleboard	1.49	0.006	0.44	0.47	1.34	≤0.01	0.11	0.54
Veneer sheet	1.87	0.004	0.37	0.66	1.17	≤0.01	0.08	0.61
All wood-based panels	1.30	<0.001	0.11	0.92				

$In(C_{ij})$	95% Confidence Interval $B1_i$		n_i	95% Confidence Interval BB_i		n_i
	Lower	Upper		Lower	Upper	
All industrial roundwood	0.01	0.11	10	-0.25	0.11	113
Coniferous industrial roundwood	0.65	0.90	10			
Non-coniferous industrial roundwood	-0.08	0.18	10			
All sawnwood	-0.81	0.21	13	0.71	0.99	155
Coniferous sawnwood	-1.04	0.25	13			
Non-coniferous sawnwood	-0.51	0.24	13			
Fibreboard	1.09	1.37	13	1.10	1.46	126
Plywood	0.91	1.49	14	1.01	1.33	143
Particleboard	0.52	2.46	13	1.12	1.56	119
Veneer Sheet	1.06	2.68	13	1.01	1.33	143
All wood-based panels	1.06	1.54	14			

[121] All GDP per capita and the apparent consumption per thousand capita values are in 1996. Buongiorno, *et al.* (2001) have used "*other industrial roundwood*" instead of "*all industrial roundwood*"; "*all sawnwood* plus *sleepers*" instead of "*all sawnwood*"; and "*plywood* plus *veneer sheet*" instead of "plywood" and "*veneer sheet*" alone.

[122] The coefficient is not significant at 5% level, and the adjusted R^2 is small.

Chapter 8 DRIVERS OF FUTURE WOOD CONSUMPTION

Solberg (1996) states that long-term wood products consumption can be influenced by many macroenvironmental factors. In order to examine whether the recent surge in demand of wood products from China can be sustained in the long-term, the economic, political, socio-demographic, technological, and environmental drivers will be examined.

8.1 Economic & Political Drivers

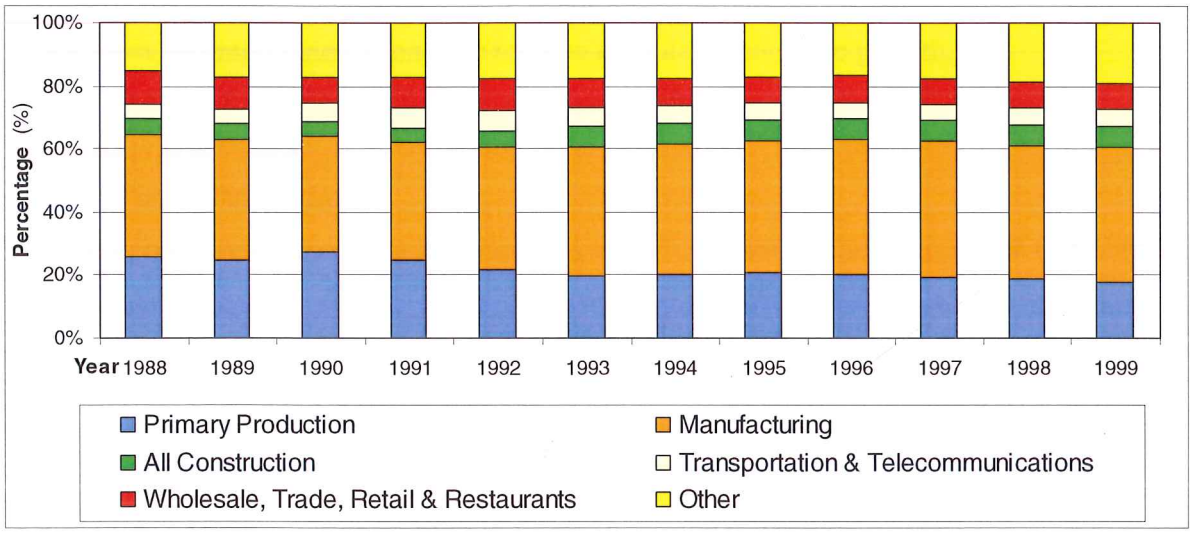
Economic drivers refer to the factors that affect buying power and pattern whereas political environment drivers consist of laws, agencies, and groups that influence or limit marketing actions (Kotler & Armstrong, 1999). In Chapter 7, real GDP per capita (RMB¥, at 1999 prices) was used to represent the average income per capita in China. The results indicate that the apparent consumption per thousand capita of many wood-based panel products will increase if the Chinese real GDP per capita increases. China's real GDP increased at an average of 8.3% per annum between 1995 and 2000 (International Monetary Fund, 2002). In order to examine whether the consumption of wood products in China will continuously increase, the driving forces of China's recent economic growth will be examined.

Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is a nation's total domestic income and the total expenditure on its output of goods and services. **Real GDP** is the value of goods and services that are measured using a constant set of prices (Mankiw, 2000). The "all construction sector" accounted for 6.6% of the total gross domestic product by value in 1999 in China (Figure 8.1). It is relatively unchanged since the early 1990s. As Yang (2001) found that the all

construction sector accounted for 64% of the total industrial timber consumption in 1997,[123] the demand of wood products for construction is likely to increase if the Chinese GDP continues to grow.

Figure 8.1 China: Gross Domestic Product by Sector, 1988 – 1999.



Source: China State Statistical Bureau (2000)

Figure 8.1 shows that manufacturing sector is the most important component of the GDP the GDP growth is mainly driven by manufacturing sector whereas domestic consumption (wholesale, trade, retail, & restaurants) accounted for less than 10% of the total GDP in 1999. In contrast, Prystay (2002) reports that domestic consumption in South Korea accounted for 60% of its GDP in 2002. This suggests that the development of retail complexes and restaurants is likely to expand. Hence, the demand of wood products for interior decoration and furniture is likely to increase.

[123] Yang (2001) does not state whether "total industrial timber consumption" is in the unit of roundwood equivalent volume or sawn timber.

Macroeconomic Policy

The Chinese macroeconomic policy is likely to influence the demand for wood products for the housing construction, interior decoration, and furniture sector. According to Scollay and St John (2000), changing interest rates through monetary policy, changing government expenditure through fiscal policy, and changing exchange rates through exchange rate policy are the most common macroeconomic tools to stimulate economic growth.

Monetary Policy: Interest Rate

Monetary policy refers to changes in money supply by adjusting the interest rate (Scollay & St. John, 2000). The number of new dwellings depends on the interest rate, the cost of borrowing. The demand for wood products for the housing construction, interior decoration, and furniture sectors depends on the number of new dwellings. Therefore, understanding the trend of the interest rate is essential for determining future demand.

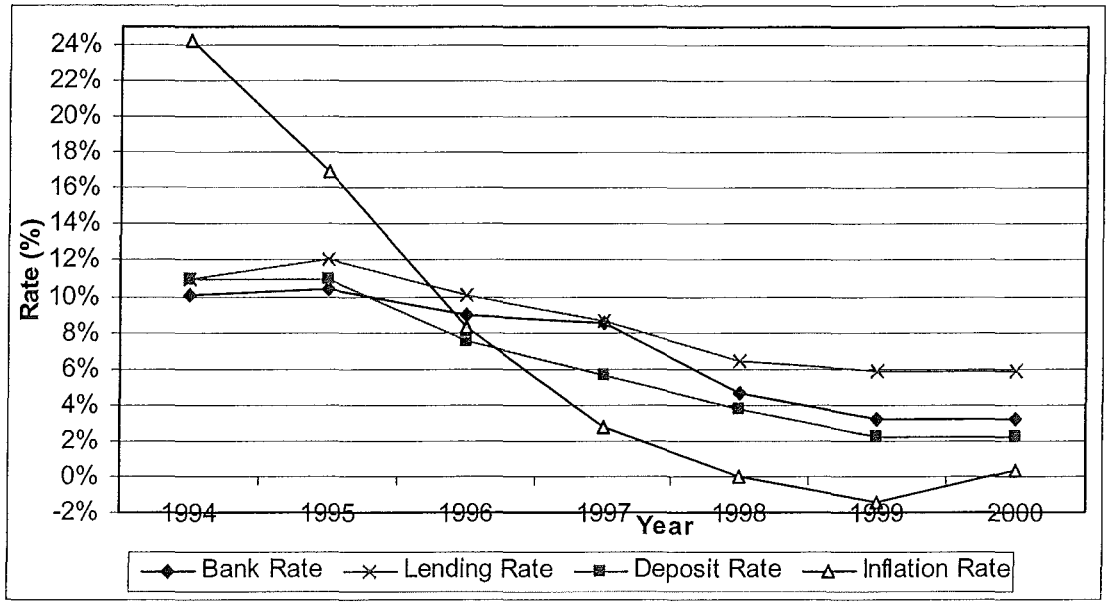
Previously, the annual inflation rate peaked at 24% in 1994 (Figure 8.2), the monetary authority increased the bank rate to the peak of 10.44% in 1995. The deposit rate was set at 10.98% in 1994, which was higher than the bank rate in order to encourage people to postpone their consumption. Since the Asian Crisis in 1997, inflation has been under control, and leading into deflation. The bank rate has lowered in order to stimulate domestic consumption and investment.

In November 2001 Zhu Rongji, the Premier, mentioned that the housing construction and real estate sectors were growing too fast because the proportion of unoccupied floor space was relatively high. There was a risk of developing a bubble economy in China.[124] He recommended that the monetary authorities should reduce the amount of capital that the

[124] Source: Mingpao News. 4 November 2002. Premier Warns of Bubble Economy in China. Mingpao News. Hong Kong. (http://full.mingpaonews.com/20021104/t_cak1.htm) [4 November 2002] (*in Chinese*)

supply to the housing construction sector. Hence, the demand for wood products is likely to slow down in the next few years from the housing construction sector.

Figure 8.2 China: Bank Rate[125], Deposit Rate[126], Lending Rate[127], and Inflation Rate, 1994 to 2000.



Source: International Monetary Fund (2002)

Fiscal Policy: Government Expenditure

Table 8.1 shows the total revenue and expenditure of the Government in China. In order to generate employment and stimulate growth of the economy since the Asian Crisis in 1997, the Government's total expenditure has increased at a faster rate than its total revenue. The government deficit[128] has increased from 0.8% of the nominal GDP in 1997 to 2.8% of the nominal GDP in 2000. This is getting close to the European Union's budget deficit ceiling, 3% of the GDP (Mitchener, 2002).

[125] **Bank Rate** (end of period): Rate charged by the People's Bank of China on 20-day loans to financial institutions.
[126] **Deposit Rate** (end of period): interest rates on institutional and individual deposits of one-year maturity.
[127] **Lending Rate** (end of period): Rate on working capital loans of one-year maturity.
[128] Government deficit refers to a negative balance by subtracting total government revenue minus total government expenditure at the end of each financial year.

Furthermore, Hutzler (2002) states that although China's total government budget deficit only accounted for 2.8% of the nominal GDP in 2000, these figures do not include the crippling long-term debt burdens from unrecoverable state-bank loans and unfunded pensions. Thus, the government deficit is likely to be greater than the 3% threshold.

Expenditures on social welfare, wages of civil servants, transportation networks, and many large-scale infrastructure projects are the major contributors to the widening deficit (China State Statistical Bureau, 2000). Hence, the government is unlikely to stimulate economic growth by housing construction.

Table 8.1 China: Government Finance, 1994 - 2000.

China: Government Finance (in billion Yuan)					
Year	Total Revenue and Grants	Expenses & Lending Minus Repay	Deficit (-) or Surplus	Nominal GDP	Proportion of Government Deficit of Nominal GDP (%)
1994	522	579	-57.5	4,676	1.2%
1995	624	682	-58.2	5,848	1.0%
1996	741	794	-53.0	6,788	0.8%
1997	865	923	-58.3	7,446	0.8%
1998	988	1,080	-92.2	7,835	1.2%
1999	1,144	1,319	-174.4	8,205	2.1%
2000	1,340	1,587	-247.4	8,940	2.8%

Source: International Monetary Fund (2002)

Exchange Rate Policy: Net Export Expenditure & Terms of Trade

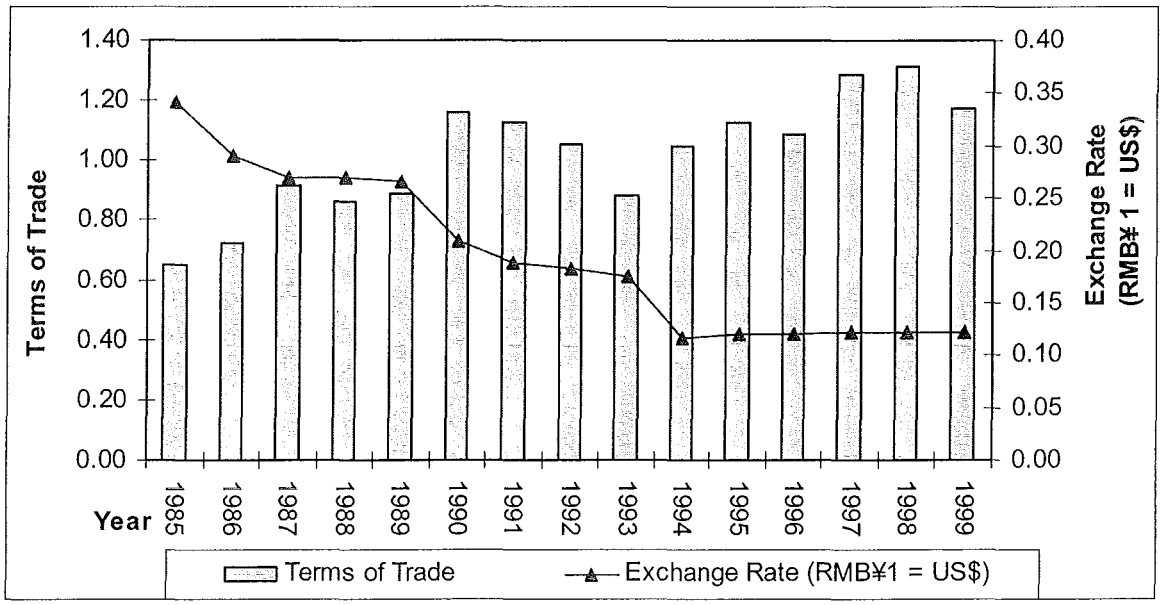
The exchange rate policy affects the relative purchasing power of Chinese wood consumers in international trade. The competitiveness of New Zealand wood products in China can be highly influenced by the fluctuating exchange rate. Understanding the exchange rate trend is essential for the New Zealand forestry sector in conducting business in China.

Krugman & Obstfeld (2000) describe that Thailand, South Korea, and Indonesia had attracted large inflows of capital from the international market prior to 1997, which allowed these countries to import considerably more than they export. Deterioration of terms of trade

during 1997 and 1998 had resulted in these Asian countries going quickly from receiving large capital inflows to having large capital outflows.

Similarly, in terms of value, China imported more than its exports between 1985 and 1989, when terms of trade was less than one, resulting in the RMB¥ depreciating by 22% (Figure 8.3). Furthermore, when the terms of trade declined to less than one in 1993, RMB¥ depreciated by 50% in 1994. Figure 8.3 illustrates that China tends to depreciate its currency against the US dollar if its terms of trade is less than one. This would reduce the competitiveness of New Zealand's wood products compared to the Chinese domestic market.

Figure 8.3 China: Terms of Trade and Exchange Rate (RMB¥ 1 = US$), 1985 -1999.[129]



Source: China State Statistical Bureau (2000)

[129] **Terms of Trade** = *Total Value of Exports / Total Value of Imports*

Political Issues

As China's economic growth is still highly dependent on the governmental planned economy, understanding the government's directions would be useful for observing the future demand for New Zealand wood products. A survey conducted by Qing & Xie (2001) with a total of 128 Chinese communist politicians and cadres shows that 35% of the respondents considered that economic development was below their expectation during 2000 whereas only 9% and 25% thought so for 1998 and 1999 respectively (Table 8.2). Politicians are likely to stimulate economic growth by increasing the Government's expenditures in social welfare. Increases in government expenditure results in increasing government deficit as indicated in China State Statistical Bureau (2000).

Table 8.2 China: Politician and Cadres' Evaluation on China's Economic Development, 1998 and 2000.

Progress	1998	1999	2000
At an adequate rate	82%	65%	59%
At an excessive rate	7%	7%	2%
Below expectation	9%	25%	35%
No sign of growth	3%	3%	4%

Source: Qing & Xie (2001)

The percentage of respondents who viewed that housing was the first priority issue declined from 5% in 1999 to 2% in 2000 (Table 8.3). Expenditure on state housing units is unlikely because it has become a minor issue among the respondents (Qing & Xie, 2001). This suggests that demand for private housing is likely to increase.

However, more respondents viewed that unemployment, public health, and income disparity became more important issues in 2000 than in 1999 (Table 8.3). Hence, a reduction of value-added tax in China is unlikely, and the opportunity for value-added wood products from New Zealand is still uncertain.

Table 8.3 The Most Important Social and Political Issues Concerned by the Chinese Politicians and Cadres.

	RANKING					
	First Priority		*Second Priority*		*Third Priority*	
ISSUE	**1999**	**2000**	**1999**	**2000**	**1999**	**2000**
Government Structure & Human Resource	30%	25%	16%	16%	12%	9%
Housing	5%	2%	6%	2%	5%	2%
Unemployment	1%	7%	8%	9%	7%	9%
Public Health System	1%	5%	10%	7%	13%	6%
Education & Technology	5%	3%	15%	3%	15%	6%
State Owned Enterprises	33%	14%	26%	23%	17%	17%
Income Disparity	3%	9%	8%	23%	13%	25%
Political Issue	19%	34%	10%	10%	11%	14%
Tax & Finance	2%	1%	2%	5%	5%	9%
Other	1%	1%	1%	2%	5%	4%

Source: Qing & Xie (2001)

China's Accession to WTO

China's accession to WTO will have profound effects on all aspects of the economy, particularly agriculture, banking, and other the state-owned sectors. In terms of wood products, trade potential will be directly improved with the gradual removal of formal trade barriers. According to the WTO agreement,[130] imports of unprocessed coniferous logs and sawn timber, and many other wood-based products (Appendix 8.1) will be liberalised within 3 years after 11 December 2001, the date of accession. However, the removal of the value-added tax (VAT), currently at 17%, is not included as part of the accession procedures. Thus, imported wood products will continuously face a cost disadvantage compared to domestic wood products.

[130] Source: World Trade Organization. 2002. (http://www.wto.org) [10 November 2002]

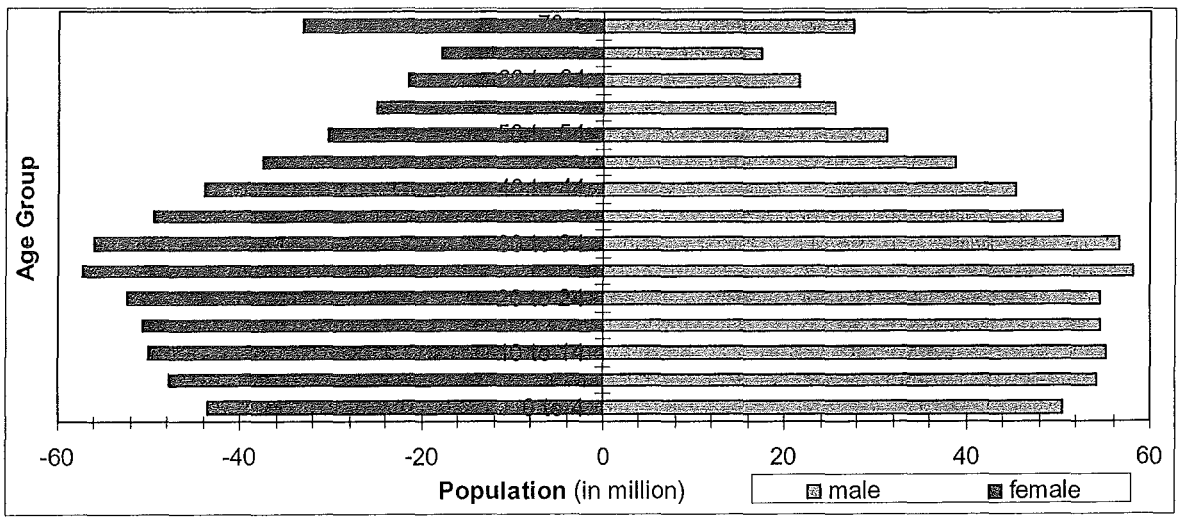
8.2 Socio-Demographics Drivers

Socio-demographic drivers refer to factors that relate to the development and the structure of society as well as the pressure caused by new and evolving attitudes (Kotler & Armstrong, 1999). Various socio-demographic drivers are likely to influence the demand for wood products in China.

Population by Age Group & Sex

The 1999 age pyramid in Figure 8.4 shows the Chinese population by age group and sex. The population below aged 25 has gradually decreased due to announcement of the single child policy in late 1970s (Asian Demographics Limited, 2001). According to the market research conducted by East Marketing Research Co Limited in 2000, 73% of the new homebuyers in Guangzhou were aged between 20 to 40 years old. Hence, the demand for new housings is unlikely to be sustained indefinitely.

Figure 8.4 China: Population by Age Group and Sex in 1999.



Source: Asian Demographics Limited (2001)

Cultural Bias

The ratio between male and female is imbalanced due to the gender bias in the tradition Chinese culture (Figure 8.4), especially in the younger age group (below 20s). Hence, a significant proportion of males will not be able to get married. If these people were still single when they reach their 20s or 30s, the demand for family housing units will decline.

Birth Rate, Death Rate, and Natural Growth Rate

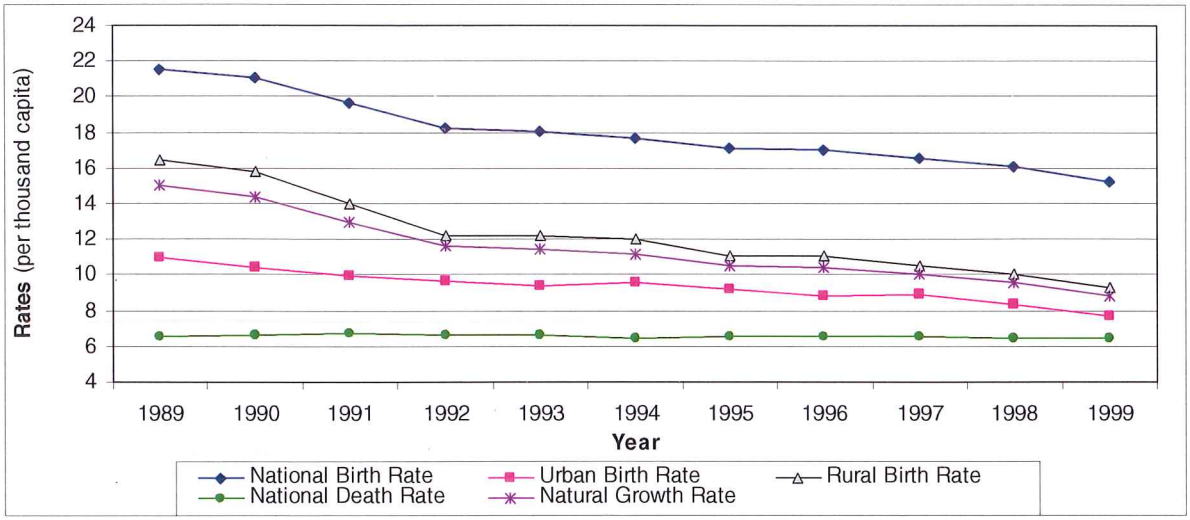
The willingness of married couples to have a child has lowered since the 1990s. The national growth rate has gradually decreased while the death rate has remained static since 1989 (Figure 8.5).The natural growth rate in urban areas (Shanghai, and Beijing) is very close to zero (Table 8.4).

China State Statistical Bureau (2000) shows that the majority of population growth is in the rural regions. Apart from Guangdong, the natural growth rates in most main provinces and cities were below the national average in 1999 (Table 8.4), Shanghai even recorded a negative 1.1% growth rate in 1999. This suggests that the future housing demand will be concentrated in certain regions, and demand for housing in major cities is likely to be driven by migrants.

Ageing Population & Average Household Size

China will have a rapidly ageing population. The population projected by Asian Demographics Limited (2001) shows that in 2015, 28% of the total population will be aged above 60, 55% of the population will be of the working age (15 to 60), and only 17% of the total population will be less than aged 14.

Figure 8.5 China: Birth and Death Rates by Urban and Rural, 1989 - 1999.



Source: China State Statistical Bureau (2000)

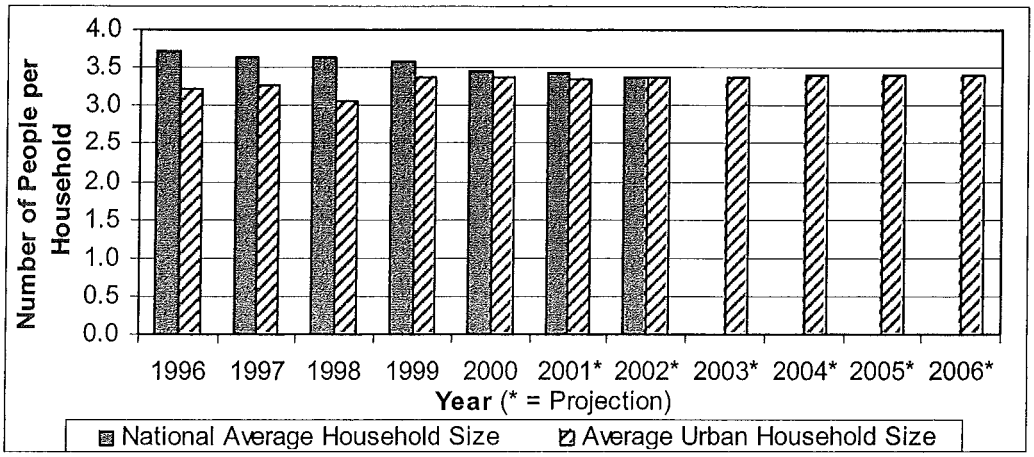
Table 8.4 China: Natural Growth Rate by Main Province or City in 1999.

Location	Region	Total Population (in million)	Birth Rate (%)	Death Rate (%)	Natural Growth Rate (%)
	National	**1259.1**	**15.23**	**6.46**	**8.77**
Central North	Beijing	12.6	6.50	5.60	0.90
Central North	Tianjin	9.6	9.68	6.73	2.95
North-Eastern	Liaoning	4.17	10.38	7.05	3.33
Eastern	Shanghai	14.7	5.40	6.50	-1.10
Eastern	Jiangsu	72.1	10.50	6.94	3.56
Eastern	Zhejiang	44.8	10.64	6.35	4.29
Eastern	Shandong	88.8	11.08	6.27	4.81
Southern	Guangdong	72.7	15.32	5.40	9.92
Western	Sichuan	85.5	13.80	7.02	6.78
Western	Chongqing	30.8	11.90	6.94	4.96
North-Western	Shaanxi	36.18	12.51	6.38	6.13

Source: China State Statistical Bureau (2000)

Meanwhile, the national average household size has declined from 3.7 per household in 1996 to the projected 3.4 per household in 2000 (Figure 8.6). The urban average household size remained static between 1999 and 2000, and it is projected to remain the same until 2006 (Asian Demographics Limited, 2001). The aging population combined with the reducing national average household size indicates that married couples tend to live independently from their parents. This suggests that there is a growing demand for retirement homes, or some form of elderly care type facilities in China.

Figure 8.6 China: National & Urban Average Household Sizes, 1996 - 2006.[131]



Source: Asian Demographics Limited (2001)

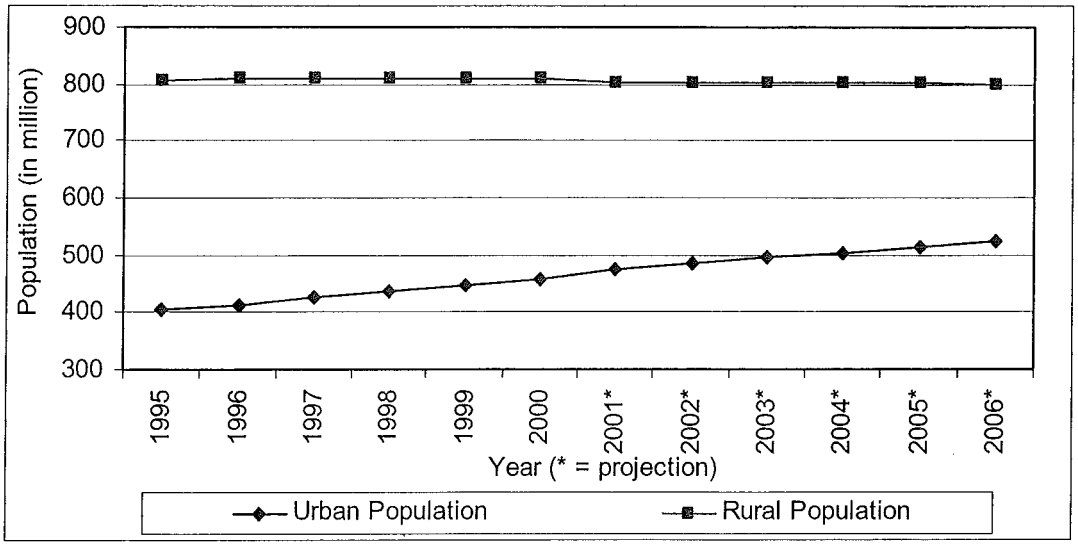
Urban Drift

The urban population is projected to increase from 458 million in 2000 to 524 million people in 2006 (Asian Demographics Limited, 2001). This is equivalent to 13 million people drifting from rural to urban areas each year. According to the World Bank (1997), peasants registered in rural areas are not entitled to access certain social welfare, such as a housing benefit. They have to find their own accommodation or be provided by their employer. Most of these rural workers are poorly skilled and earn just above the minimum wage. They are unlikely to be homeowners in urban areas.

However, the secondary real estate market in China is still undeveloped. These rural labourers in urban areas with limited income might become important players in the rental and secondary housing market in urban areas. As the demand for secondary housing units increases, urbanites will be able to upgrade their existing homes or increase their investment in the real estate market.

[131] Year 2001 to 2006 are projected by Asia Demographics Limited (2001).

Figure 8.7 China: Urban and Rural Population *(in million)*, 1995 -2006.



Source: Asian Demographics Limited (2001)

Income Distribution

The income distribution in China is summarised in Table 8.5 and Figure 8.8. Table 8.5 shows that the richest 10% of Chinese own 30.4% of the total national income while the richest 20% of Chinese own 44.6% of the total national income. In contrast, the income of the poorest 20% only accounted for 5.9% of the total national income in 1998. By comparing with other countries, the income inequality in China is more serious than Australia and Japan, but it is slightly better than in the United States, Malaysia, and Brazil.

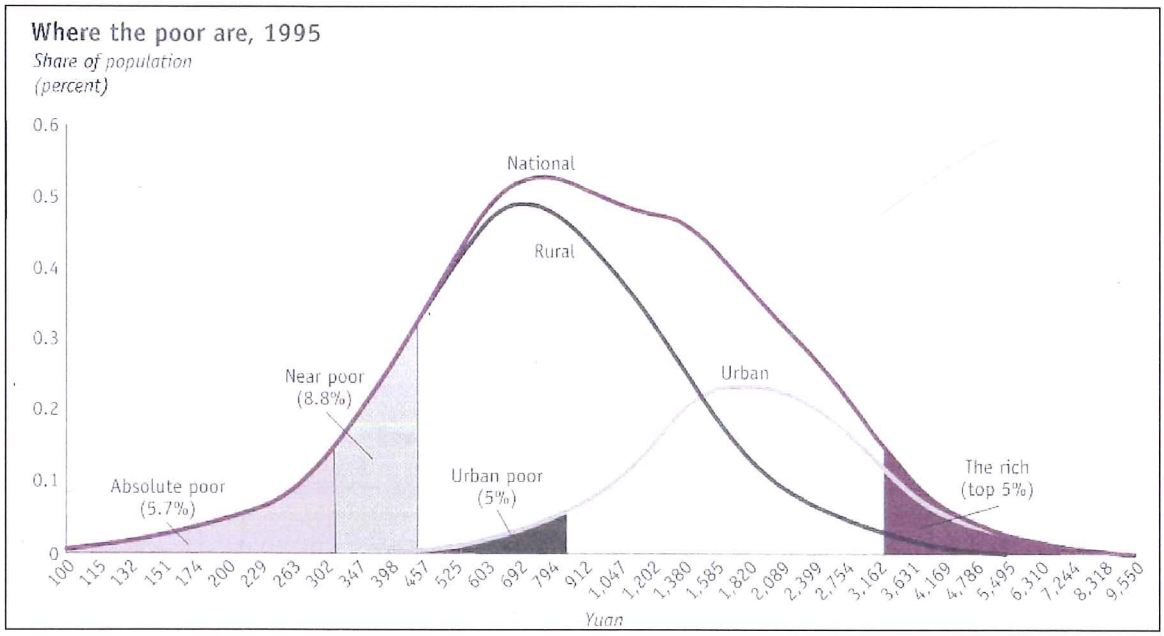
Table 8.5 Shares of Total National Income in Selected Countries (in %).

Country	*Surveyed Year*	Shares of the Total National Income (%)			
		Poorest 10%	*Poorest 20%*	*Richest 20%*	*Richest 10%*
China	1998	**2.4**	**5.9**	**44.6**	**30.4**
U. S. A.	1997	1.8	5.2	46.4	30.5
Australia	1994	2.0	5.9	41.3	25.4
Japan	1993	4.8	10.6	35.7	21.7
Malaysia	1997	1.7	4.4	54.3	38.4
Brazil	1997	1.0	2.6	63.0	46.7

Source: United Nations Development Programme (2001)

Figure 8.8 shows that income disparity is widening between rural and urban households. The income of the poorest 5% of urban households is approximately located at the median income of the rural households. This suggests that the real consumption power is in the cities and urban areas, where people are also generally better educated and less traditional in their consumption habits.

Figure 8.8 China: Income Distribution by Rural and Urban in 1995.



Source: The World Bank (1997)

Productivity

Many analysts describe that China has a very competitive advantage in terms of labour cost. However, Krugman & Obstfeld (2000) suggest that the productivity of the workers will determine their real wage rate in the long-term. For example, the productivity of West Germany and Japan has increased by 133% and 260% respectively whilst their real wages have increased by 192% and 220% respectively between 1963 and 1996 (Table 8.6).

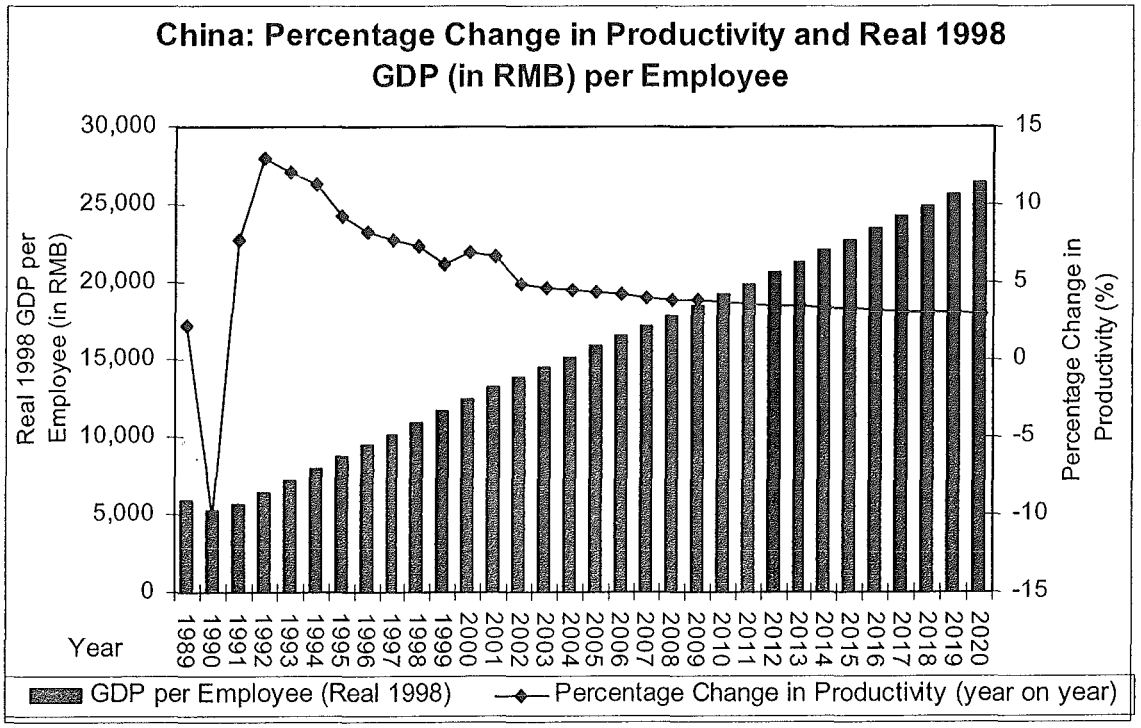
Table 8.6 Percentage Change in Real Wages and Productivity in West Germany and Japan between 1963 and 1996.

	Productivity (% of U.S. Level)		Percentage Change between 1963 &1996 (%)	
Country	*1963*	*1996*	*In Productivity*	*In Real Wages*
United States	100	100	49	34
West Germany	58	91	133	192
Japan	32	76	260	220

Source: Krugman & Obstfeld (2000)

As the productivity per capita in China is projected to increase by 3% per annum between 2000 and 2020 by Asian Demographics Limited (2001), the real wage in China is also likely to increase (Figure 8.9).

Figure 8.9 China: Real GDP per Employee and the Percentage Change in Productivity, 1989 – 2020.[132]



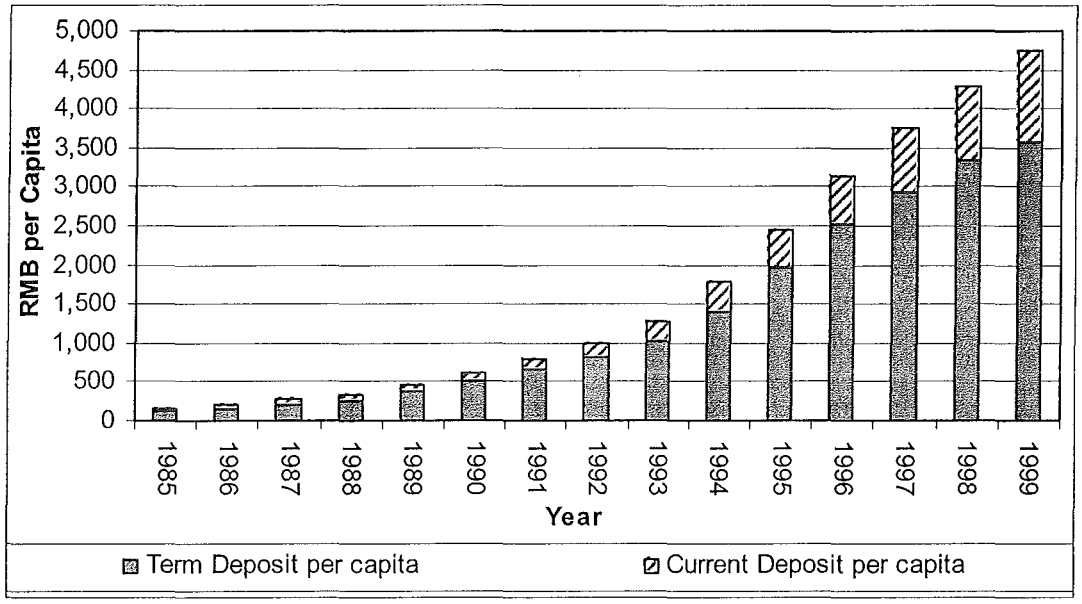
Source: Asian Demographics Limited (2001)

[132] Figures from year 2000 to 2020 are projected by Asian Demographics Limited (2001).

Saving

The Chinese are culturally biased to save rather than spend. Figure 8.10 shows that the current and term savings per capita in China are continuously increasing, especially the current deposit per capita. This suggests that average Chinese are more affluent, and they are more confident and optimistic about the future economy.

Figure 8.10 China: Current and Term Savings per Capita, 1985 - 1999.



Source: China State Statistical Bureau (2000)

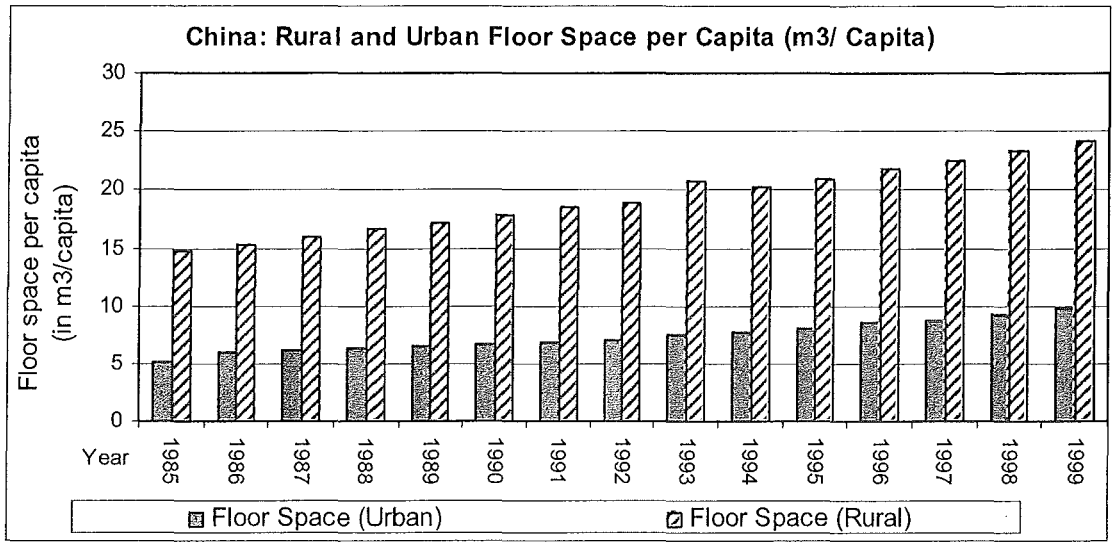
According to the market research conducted by East Market Research (2001),[133] bank deposit, insurance, and shares are the investment tools most preferred by the respondents. Investment in the real estate market was rated as the least common tool. Lack of a secondary market and a short durability of these housing units might contribute to this outcome. This suggests that if secondary market is developed and investors' confidence in the real estate market can be established, the huge amount of saving in the banks will be able to accelerate the future housing demand.

[133] Source: East Market Research. 2002. (http://www.emr.com.cn/barometer/article12.htm) [1 May 2002]

Average Floor Space per Capita

The average floor space per capita has gradually increased over the past 15 years in both rural and urban areas. Although the average rural households are relatively poorer than urban households, the average floor space per capita in rural areas has increased at a faster rate. This indicates that the population density in urban areas has become relatively more intense than in rural areas. Individual wood-framed houses will be limited in many urban areas.

Figure 8.11 China: Average Floor space per capita in Rural and Urban, 1985 – 1999.



Source: China State Statistical Bureau (2000)

Number of Private Cars

As Chinese households become more mobile and transportation systems improve, high-density urbanised areas are likely to spread into rural areas. The number of private cars has increased from 2.9 million in 1996 to 5.3 million in 1999 (Table 8.7). This suggests that wood framed housing units would still be possible for many urbanites.

Table 8.7 Number of Private Cars in China, 1996 – 1999.

	1996	1997	1998	1999
Number of Private Cars (in million)	2.90	3.58	4.24	5.34

Source: China State Statistical Bureau (2000)

Average Length of Haul: Domestic freight

A majority of the freight is transported via railway, water, or by air. The average length of haul for domestic freight via highway has risen steady since the 1990; although, it is relatively restricted with an average of 60 km per haul. Although China and the United States have a similar land mass,[134] the average length of haul in Chin via highway is much shorter than the United States (Table 8.8).

The transportation problem is one of the reasons why most of the economic development and manufacturing sectors are clustered in the coastal regions. Interprovincial freight is mainly transported by railway, water, and air. Consequently, most of the manufacturing sectors and population are concentrated in the coastal regions, and along the Yellow River and Yangtze River.

Table 8.8 China & the United States: Average Length of Haul for Domestic Freight (in km).

China					United States	
(Year)	Railway	Highway	Water (Channel)	Air Freight	Highway: Truck (Class I & II)	Railway (Class I)
1989	686	46	1,281	2,226	-	-
1990	705	46	1,447	2,218	629	1,168
1991	718	46	1,554	2,234	641	1,209
1992	734	48	1,433	2,330	660	1,228
1993	735	48	1,415	2,393	655	1,278
1994	791	50	1,465	2,241	631	1,315
1995	807	50	1,551	2,206	669	1,357
1996	768	51	1,402	2,168	686	1,355
1997	770	54	1,696	2,334	700	1,370
1998	763	56	1,771	2,388	715	1,344
1999	768	58	1,855	2,482	732	1,349

Sources: China State Statistical Bureau (2000) & United States Department of Transportation (2002)

[134] Source: Central Intelligence Agency. 2002. The World Factbook 2002. (http://www.odci.gov/cia/publications/ factbook/index.html) [10 November 2002]

Number of Visitors: International & Domestic Visitors

The total number of international visitors has increased from 46.4 million in 1995 to 72.8 million in 1999. The majority of these visitors are from Hong Kong and Macau. Foreigners only accounted for 11% to 13% of the total number of international visitors since 1995 (Table 8.9). Despite of the proportion of foreigners being unchanged, the number of foreigners rose from 5.9 million in 1995 to 8.4 million in 1999. Many of these international visitors are business people and Chinese expatriates, and they are the most important groups of potential wood-framed house buyers (USDA, 2002).

The Chinese domestic tourism market is worth considering (Table 8.9). It is a greater market than the international tourism market in terms of number of visitor and total revenue because most local Chinese have to go through complicated procedures to obtain their visitor visas in order to holiday overseas.

Table 8.9 The Tourism Sector in China: Number of Visitors and Total Revenues.

	1995	1996	1997	1998	1999
Total Number of International Visitors *(in million)*	**46.4**	**51.1**	**57.6**	**63.5**	**72.8**
Foreigners	5.9	6.7	7.4	7.1	8.4
Chinese ethnic	0.1	0.2	0.1	0.1	0.1
Hong Kong & Macau	38.9	42.5	47.9	54.1	61.7
Taiwan	1.5	1.7	2.1	2.2	2.6
% Change in the total number of international visitors		10%	13%	10%	15%
Total Number of Domestic Visitors *(in million)*	**629.0**	**639.0**	**644.0**	**694.5**	**719.0**
% Change in the total number of domestic visitors		2%	1%	8%	4%
Total Revenues from International Visitors *(in billion US Dollars)*	**8.7**	**10.2**	**12.1**	**12.6**	**14.1**
% Change in the total revenues from international visitors		17%	18%	4%	12%
Total Revenue from Domestic Visitors *(RMB in billion Yuan)*	**137.6**	**163.8**	**211.3**	**239.1**	**283.2**
% Change in the total revenues from domestic visitors		19%	29%	13%	18%

Source: China State Statistical Bureau (2000).

The international tourism industry in China generated US$ 14 billion of foreign revenues in 1999, of which US$ 2 billion was spent on accommodation related expenditure. Table 8.10 shows that the accommodation expenditure accounted for about 14% of total expenditure in 1998 and 1999. This suggests that there is a growing demand of construction, interior decoration materials, and furniture for the hospitality sector.

Table 8.10 China: Total Expenditures of International Visitors by Item *(in million US$).*

	1998		1999	
	Value	(%)	Value	(%)
Total Expenditure	**12,602**	**100.0**	**14,099**	**100.0**
International Carriers	3,185	25.3	4,165	29.6
Domestic Carriers	2,237	17.8	3,140	22.3
Goods	2,591	20.6	2,771	19.7
Accommodations	1,737	13.8	2,034	14.4
Food & Beverage	1,548	12.3	1,528	10.8
Other Services	1,239	9.8	1,063	7.5
Entertainment	810	6.4	845	6.0
Sceneries	548	4.3	749	5.3
Local Transport	442	3.5	533	3.8
Railway	333	2.6	445	3.2
Telecommunication	502	4.0	411	2.9
Land Transport	327	2.6	382	2.7
Ships	288	2.3	198	1.4

Source: China State Statistical Bureau (2000)

Prospects for China's Future Economic Growth

Krugman & Obstfeld (2000) describe that a high saving rate and the process of correcting dualism are the major factors which have driven China's economic growth in the 1990s. They believe that these factors are critical to China's economic growth.

China has had a very high saving rate and thus has rapidly increased its capital stock (Table 8.11). This is consistent with the experience of other high-performance Asian economies (HPAEs), which have grown rapidly in large part simply through rapid accumulation of inputs (Krugman & Obstfeld, 2000). In addition, higher saving rates reduce the capital cost of manufacturers as well as other borrowers.

Table 8.11 China: Percentage of Total Saving (Term Deposit) by Nominal GDP, 1990 – 1999.

Year	Term Deposit (in billion RMB)	Curent Saving (in billion RMB)	Total Saving	% of Term deposit of GDP (*Nominal*)
1990	591	121	712	32%
1991	769	155	924	36%
1992	943	233	1176	35%
1993	1197	323	1520	35%
1994	1684	468	2152	36%
1995	2378	588	2966	41%
1996	3087	765	3852	45%
1997	3623	1005	4628	49%
1998	4179	1162	5341	53%
1999	4496	1467	5962	55%

Source: China State Statistical Bureau (2000)

Dualism

Dualism is the effect of a wage differential between sectors (the manufacture and agriculture sectors) due to the inefficient allocation of labourers within a country (Krugman & Obstfeld, 2000). The concept of dualism can be illustrated in Appendix 8.2.

China's pre-1978 polices discouraged rural workers from moving to urban industrial jobs, and at the same time prevented the agricultural sector from shedding unproductive labour. As the surplus labour in rural areas was high, the marginal production of workers in farms was low.

Since the liberalisation of the economy in 1978 (subject to certain restrictions), there has been a massive shift of rural migrants (*30 to 200 million*) from the agricultural sector to the manufacturing sector (The World Bank, 1997). Because the Chinese government is able to control the surplus labour supply through the household registration system, both agricultural and manufacturing sectors have had a sufficient supply of labourers. Asian Demographics Limited (2001) projected that rural migrants would be expected to continue to drift to urban areas because the natural growth rate in rural is still higher. Hence, the supply of rural migrants is likely to be sustained.

As both high saving rates and the supply of rural migrants continues, China's fast economic growth is likely to continue. However, Krugman & Ostfeld (2000) suggest that both capital and labour inputs are subject to diminishing return. China's fast economic growth is unlikely to be as fast as in the 1990s.

8.3 TECHNOLOGICAL DRIVERS

Technological drivers refer to the research and development (R&D) budget and the pace of technological change (Kotler & Armstrong, 1999). In order to measure the pace of technological changes in China in relation to other countries, Technology Achievement Index (TAI), research and development expenditures (R&D), foreign direct investment (FDI), and wood recovery rate in China will be examined.

Technology Achievement Index

Table 8.12 Technology Achievement Index (TAI) for Selected Countries in 2001.

TAI Rank	Country	TAI Index Value	Interest hosts (per 1,000 people 2000)	High- and medium technology exports (as % of total goods exports in 1999)	Telephones (mainlines and cellular, per 1,000 people in 1999)	Electricity consumption (kW hours per capita in 1998)	Mean years of schooling (age 15 & above in 2000)	Gross tertiary science enrolment (%) 1995-1997
1	Finland	0.744	200	50.7	1203	14129	10.0	27.4
2	United States	0.733	179	66.2	993	11832	12.0	13.9
3	Sweden	0.703	126	59.7	1247	13955	11.4	15.3
4	Japan	0.698	49	80.8	1007	7322	9.5	10.0
5	South Korea	0.666	5	66.7	938	4497	10.8	23.2
7	UK	0.606	57	61.9	1037	5327	9.4	14.9
9	Australia	0.587	126	16.2	862	8717	10.9	25.3
11	Germany	0.583	41	64.2	874	5681	10.2	14.4
15	New Zealand	0.548	147	15.4	720	8215	11.7	13.1
45	China	0.299	0.1	39.0	120	746	6.4	3.2

Source: United Nations Development Programme (2001)

China's Technology Achievement Index (TAI) is ranked at 45th in the world (Table 8.12). China is far behind most of the developed countries in almost all categories, except in the category of the proportion of high & medium-technology of the total goods exported, where China preformed better than Australia and New Zealand because Australia and New Zealand export a larger proportion of agriculture and commodity goods.

Education and Research and Development (R & D)

The average years of schooling in China (*for population aged 15 and above*) reached 6.4 years in 2000. This is low compared to other developed countries. (Table 8.13). For example, the mean years of schooling has increased by 0.9 year in South Korea whereas China has only increased by 0.5 year between 1990 and 2000.

Furthermore, the proportion of R&D expenditures in GNP, and the ratio of scientists and engineers in R&D per 100,000 people in China are relatively small compared to most developed countries (Table 8.13). This suggests that poor labour skills and low productivity are still limiting factors among the average labour force in China.

Table 8.13 The Mean Years of Schooling, R&D Expenditures, and the number of scientists and Engineers in R&D for Selected Countries.

HDI Rank	Country	Mean Years of Schooling [age 15 and above]			Research & Development (R & D) Expenditures [As % of GNP (1987-1997)]	Scientists and Engineers in R&D [per 100,000 people 1987-1997]
		1980	*1990*	*2000*		
1	Norway	8.2	11.6	11.9	1.6	3664
2	Australia	10.3	10.4	10.9	1.8	3357
3	Canada	10.3	11.0	11.6	1.7	2719
6	United States	11.9	11.7	12.0	2.6	3676
9	Japan	8.5	9.0	9.5	2.8	4909
17	Germany	-	9.9	10.2	2.4	2831
19	New Zealand	11.5	11.3	11.7	1.0	1663
27	South Korea	7.9	9.9	10.8	2.8	2193
87	China	4.8	5.9	6.4	0.7	94

Source: United Nations Human Development (2001)

Foreign Direct Investment (FDI)

As mentioned by Krugman & Obstfeld (2000), technology can be transferred through foreign investments. Foreign direct investment (FDI) is different from other foreign investment as it involves not only a transfer of resources but also the acquisition of control (Krugman & Obstfeld, 2000). Through FDI, multinationals or joint ventures, technology can be transferred to local firms and manufacturers.

Hong Kong, the United States, Japan, Germany, Great Britain, Singapore, South Korea, and Taiwan were the main sources of China's FDI (Table 8.14). Although Hong Kong is the biggest origin of FDI, many companies are using Hong Kong as a financial hub to invest in China. The United States, Japan, and Germany have a very good reputation in terms of wood processing technology. USDA (2002) describes that wood-based panels production has increased dramatically and China has the ability to improve its technology in wood processing and manufacturing to international standard. This suggests that technology improvement in China is mostly dependent on foreign-owned and joint venture companies.

Table 8.14 Foreign Investment by Country *(in billion US$).*

	1998		1999	
	Foreign Direct Investment	Other Foreign Investment	Foreign Direct Investment	Other Foreign Investment
TOTAL	**45.46**	**2.09**	**40.32**	**2.13**
COUNTRY				
ASIA	**31.33**	**1.09**	**26.83**	**1.32**
Hong Kong	18.51	0.89	16.36	1.04
Japan	3.40	0.04	2.97	0.09
Malaysia	0.34	0.00	0.24	0.00
Singapore	3.40	0.00	2.64	0.00
South Korea	1.80	0.00	1.27	0.01
Thailand	0.21	0.00	0.15	0.00
Taiwan	2.92	0.14	2.60	0.16
Other	0.75	0.02	0.59	0.03
AFRICA	**0.16**	**0.00**	**0.20**	**0.00**
EUROPE	**4.31**	**0.10**	**4.80**	**0.17**
Great Britain	1.17	0.00	1.04	0.00
Germany	0.74	0.00	1.37	0.00
France	0.71	0.00	0.88	0.00
Italy	0.27	0.00	0.19	0.00
Austria	0.02	0.00	0.02	0.00
Finland	0.04	0.00	0.07	0.00
Norway	0.03	0.00	0.02	0.00
Sweden	0.13	0.10	0.16	0.17
Switzerland	0.23	0.00	0.25	0.00
Russia	0.02	0.00	0.02	0.00
Other	0.94	0.00	0.78	0.00
SOUTH AMERICA	**4.56**	**0.00**	**3.20**	**0.01**
Brazil	0.02	0.00	0.00	0.00
Chile	0.00	0.00	0.00	0.00
Other	4.54	0.00	3.20	0.01
NORTH AMERICA	**4.33**	**0.28**	**4.62**	**0.01**
Canada	0.32	0.00	0.31	0.00
United States	3.90	0.28	4.22	0.01
Other	0.11	0.00	0.09	0.00
OCEANIA	**0.53**	**0.01**	**0.51**	**0.00**
Australia	0.27	0.01	0.26	0.00
New Zealand	0.03	0.00	0.02	0.00
Other	0.24	0.00	0.23	0.00
OTHER	**0.24**	**0.62**	**0.16**	**0.61**

Source: China State Statistical Bureau (2000)

Efficiency of the Chinese State-Owned Wood Processors

Although the recovery rate statistics from the private sector are not available, the wood recovery rate statistics in 1999 from large and medium-sized state-owned wood processors in China are summarised in Table 8.15. While the recovery rate for sawn timber increased slightly between 1998 and 1999, the recovery rate for plywood declined by 3.7% during the same period. One explanation is that the logging ban in 1998 has significantly affected the quality of logs for domestic plywood production. Wood supply from native forests can be substituted by plantations for plywood production, however, most of these fast growth plantations only produce small-diameters logs, which are inadequate to produce plywood efficiently.

Table 8.15 The Recovery Rate of the Large & Medium-Sized State-Owned Wood Processors in 1999.

WOOD PROCESSOR	Recovery Rate (%)	% Change between 1998 and 1999
Sawn Timber	57.6%	0.6%
Plywood	50.6%	-3.7%

Source: China Ministry of Forestry (2000)

8.4 ENVIRONMENT DRIVERS

Environment degradation in China has become a more critical issue. For example, flooding in 1998 alone cost RMB¥ 166.6 billion (Yang, 2001). In addition, in the Central North, desertification and sand storms have seriously affected Beijing and many northern provinces, as well as South Korea and Japan.[135] As a result, the Chinese Central Government has implemented a Natural Forests Conservation Programme (NFCP) in order to protect and recover the deteriorating environment.

[135] Source: CNN. 2002. Sandstorm blankets East Asia. (http://www.cnn.com/2002/WEATHER/03/21/china.sandstorm/index.html) [15 April 2002]

Effects of the National Forest Conservation Programme (NFCP)

According to Yang (2001), the specific objectives of the NFCP in 1998 are to:

- reduce timber harvests from natural forest by 19.9 million m^3 from 1997 to 2003;
- conserve 41.8 million ha of natural forests in the upper reaches of the Yangtze River, upper and middle reaches of the Yellow River, and in Inner Mongolia, Northeast China, Xinjing Ugur Autonomous Region and Hainan Provinces; and
- establish 21.3 million ha of timber plantations from 2000 to 2005 in the upper reaches of the Yangtze River and the upper and middle reaches of the Yellow River.

Table 8.16 shows that the total area covered by the NFCP is 123.7 million ha; of which 45% is natural forest and 10% is plantation. The total area covered accounts for 75% of the total national forest cover in 1995 according to FAO (2002).[136] Hence, the logging ban should significantly reduce the domestic roundwood supply from these protected regions.

Table 8.16 The Total Forest Area (*in thousand ha*) Covered by NFCP by Region.

Region	Forest Area	Natural forests	Plantations	Open woodland & shrub-land	Land with immature trees	Non-forested land	Other forestland
Yangtze	55,150	22,800	5,890	15,680	960	9,810	10
Yellow basin	34,400	7,580	3,870	7,130	960	14,830	30
North-eastern region & Inner Mongolia	31,690	24,390	2,050	580	1,370	3,270	30
Hainan	410	320	0	10	10	70	-
Xinjiang	2,040	1,100	0	600	20	260	60
Total	123,690	56,190	11,810	24,000	3,320	28,240	130

Source: Yang (2001)

However, the China Ministry of Forestry and its NFCP have not provided any indicators regarding the national sustainable allowable cut in the long-term. Thus, the national wood supply could fluctuate until it reaches a sustainable level.

[136] According to Yang (2001), total forest area covered by NFCP was 123.7 million ha in 1998 whereas according to FAO (2002) total forest cover in China was 163.5 million ha and surveyed in 1995 (Table 8.17), resulting 75% of the total national forest cover is protected under the NFCP.

Plantations

The government policy indicates that the future industrial wood supply will be highly dependent on plantation forests (Yang, 2001). Many plantation programmes have been launched to reemploy the 1.1 million forest workers who have been affected by the logging ban (Yang, 2001).

Chinese fir and Masson pine are the main coniferous species produced from plantations in 2005, followed by Chinese pine and Cypress species (Table 8.17). Poplar and Eucalyptus are the main broadleaf species produced.

Table 8.17 The Volume Harvested from Plantation in China by Species (in *thousand* m^3)

Species	1998	1999	2000	2005
Chinese fir	2,780	5,280	5,280	17,850
Masson pine	39	39	39	2,290
Larch	83	83	83	83
Chinese pine	-	-	-	60
Cypress	-	-	-	37
Others	263	263	263	1,580
All Conifers	*3,165*	*5,665*	*5,665*	*21,900*
Poplar	5,760	5,760	5,760	14,580
Eucalyptus	110	110	1,290	1,990
Soft broadleaf	490	490	32	620
Hard broadleaf	32	32	60	32
Mixed broadleaf	60	60	150	120
Others	150	150	490	100
All Broadleaf	*6,602*	*6,602*	*7,782*	*17,442*
Total	**9,767**	**12,267**	**13,447**	**39,342**

Source: Yang (2001)

The plantation areas in China rose by an average of 1.2% per annum between 1990 and 2000 (Table 8.18). This increase is likely to continue for several reasons. Firstly, environmental degradation is become one of the alarming factors among society. Secondly, plantations will provide alternative work for the 1.1 million who lost their job because of the logging ban.

Finally, China has announced that it has ratified the Kyoto Protocol. As China is categorised as a developing nation, it is not required to reduce emissions.[137] Instead, it would be eligible to earn credits by setting up emission-reducing projects and reforestation. This provides the incentive for China's plantation sector to grow even further.

Table 8.18 China: Forest Cover and Planting Rate in China, 1990 - 2000.

Country/Region	Forest cover (ha)	Forest cover change 1990-2000 (ha/year)	(%/year)
China	163,480,282	1,806,321	1.2

Source: Food and Agriculture Organization (2002)[138]

8.5 CHAPTER SUMMARY

The construction sector has contributed to about 6% of China's GDP since the early 1990s. The proportion of construction in relation to residential housing is not known. Privatisation of the housing market, lower interest rate, and urban drift are likely to increase the demand of housing in urban areas. The demand of wood products for housing construction is likely to be sustained over the next decade.

However, the ageing population and reducing natural growth rate in urban areas are likely to reduce the demand of housing construction in the long-term. Although the demand for elderly focused accommodation will increase.

[137] Source: CNN. 2002. China Ratifies Global Warming Treaty. (http://asia.cnn.com/2002/WORLD/africa/09/03/ kyoto.china.glb/) [24 November 2002]
[138] Source: Food and Agriculture Organization. 2002. (www.fao.org) [15 April 2002]

Domestic consumption (wholesale, trade, retail, and restaurant) accounted for less than 10% of China's GDP in 1999 compared to 60% in South Korea in 2002. This suggests that the demand of wood products for interior decoration and furniture for use in shopping complexes and restaurants are likely to increase.

The use of wood products for the tourism industry is worth to considering as the uses of wood products for the hospitality and tourism related facilities are likely to increase.

The 17% value-added tax (VAT) on all imports of wood products will continue as China does not have to reduce its VAT according to the WTO agreement. As a result, many foreign and joint venture companies with modernised equipment have been shifting their production lines to China. Furthermore, with improvement of the domestic processors and manufacturers, competition in the Chinese wood products sector will be intensified.

Finally, China has ratified the Kyoto Protocol as a developing country, which means it can gain credits by establish more plantations. As a result, coniferous plantation areas are likely to increase in future and compete with New Zealand wood products.

Chapter 9 CONCLUSION AND IMPLICATIONS

The Chinese wood products market represents a significant opportunity for a substantial increase in exports of New Zealand's coniferous industrial roundwood (logs) and sawn timber for non-structural end-uses in the next decade. This opportunity has been examined in this study through qualitative and quantitative analyses.

9.1 CHINESE WOOD PRODUCTS MARKET: Supply & Demand

USDA (2002) estimates the deficit of industrial roundwood in 2002 to be 80 million m^3. This has already exceeded the projected deficit of 60 million m^3 in 2010 by Zhang *et al.* (1997). Hence, the demand for imports is likely to increase in the next decade.

The demand for coniferous unprocessed roundwood and sawn timber remained very strong in 2001. China imported more than 7 million m^3 of coniferous unprocessed roundwood and 5 million m^3 of coniferous sawn timber in 2001.

Russia is the most important supplier of coniferous roundwood and sawn timber, followed by New Zealand. The Sino-Russian agreement on wood products trade between China and Russia, which allows Russian suppliers to pay only half of the normal VAT (17% c.i.f) for their exports to China (USDA, 2001b), results in Russia having a price advantage against other coniferous suppliers.

China has imported only a small proportion of wood-based panel products (*plywood, fibreboard, particleboard, and veneer sheets*) from New Zealand in terms of volume and value in 2001. Indonesia, Malaysia, and Thailand have dominated the imports of plywood, veneer sheets, and particleboard respectively while Germany has dominated the fibreboard market.

Domestic panel production (especially plywood and fibreboard) has rapidly increased through joint venture and foreign direct investment, and the Chinese government aims to be self-sufficient rather than depend on imports (USDA, 2002). This suggests that New Zealand's wood processing industry would be facing strong competition in these wood products markets.

The current Chinese building and fire codes are not inclusive of the use of modern timber building technology, resulting in wood framed housing accounting for only 0.06% of total new housing starts in 2000. In addition, inadequately trained builders and construction workers in China, and the lack of availability of skilled wood framed construction builders, have limited the development of wood framed housing in China.

Although the use of New Zealand wood products for wood framed houses and other structural purposes are unlikely in the next few years, the demands for coniferous roundwood and sawn timber are mainly driven from temporary construction, interior decoration materials, and furniture manufacturing. As the demand from these end-uses is likely to increase and the domestic supply is unlikely to meet this demand, demand for New Zealand coniferous industrial roundwood and sawn timber is likely to increase in the next decade. However, due to domestic competition, the 17% VAT, and intensified competition from South-east Asian countries, imports of wood-based panels are unlikely to increase substantially compared to roundwood and sawn timber in the next decades.

9.2 New Zealand Exporters

Apart from intense domestic and foreign competition, New Zealand roundwood and sawn timber exporters are currently facing other difficulties in conducting business in the Chinese wood products market. Lack of warehousing facilities and subsidiaries in China limit New Zealand wood product exporters' ability to access small domestic industrial wood customers.

The New Zealand wood products exporters noted that unprocessed coniferous roundwood is mostly used in plywood production for temporary construction while different grades of sawn timber are used for temporary construction, packaging, moulding, and furniture manufacturing.

If New Zealand forest companies are committed to long-term entry into the Chinese wood products market, they should consider increasing their offshore market representatives and warehousing facilities in the near future. Furthermore, more collective action must be made to ensure the redrafted building and fire codes include the use of New Zealand pine.

9.3 Wood Consumption Behaviour: End-Users

Many Chinese homebuyers commented that wood framed houses are not suitable for highly populated areas as land prices are extremely high. However, many homebuyers stated that they preferred apartments lower than seven floors because elevators are not always reliable in China. This suggests that wood framed multi-storeys apartments might have a huge potential after the building and fire codes are redrafted.

Many Chinese use wood-based flooring, doors, and decorative board for their interior decoration. However, the appearance of uneven grain, resin, and knots have driven people away from using New Zealand pine for interior decoration purposes. This consumption behaviour also applies to the use of wooden furniture. While the New Zealand forestry sector is emphasising the pruned clear and finger-jointing ability of New Zealand pine, the forestry sector should also consider how to make the average Chinese to adopt the "art of knots"- appreciate the aesthetics of knotty timber.

Furthermore, Chinese furniture buyers tend to prefer hardwood with darker colour. This indicates that a range of wood stains of New Zealand pine should be emphasised during promotion.

9.4 Wood Consumption Behaviour: Industrial Wood Consumers

According to Cai (1998), about one-third of industrial wood consumers lack knowledge on New Zealand pine, and they have an inferior perception towards New Zealand pine. New Zealand pine is still relatively new and not too familiar to many industrial wood consumers in relation to the housing construction, interior decoration, and furniture sectors. As a result, one of the objectives of this study was to identify what are the most important factors that will influence the Chinese industrial wood consumers to adopt a new wood product.

Important Factors

This study shows that "*price*" was consistently rated as the most important factor, followed by "*environmental issues*", which will influence industrial wood consumers adopt a new wood product in relation to the housing construction, interior decoration, and furniture sectors. In addition, *wood properties*, *availability*, *product quality*, and *services* tend to be rated slightly differently among different sectors. In contrast, "*experiences of other users*"

and "*customer preferences*" were consistently rated as the least important factors among all sectors. Hence, a competitive pricing strategy with environmental labelled marketing is needed in order to promote New Zealand pine wood products to the industrial wood consumers.

Final Decision-Makers

Most respondents in this study described that the general manager and the plant manager are the final decision-makers in relation to the housing construction, interior decoration, and furniture sectors. In the housing construction sector, there are many influencers involved during the decision-making process. Hence, forest companies that target the housing construction sector should also consider other intermediate decision-makers involved during the decision-making process. These include general manager, director, purchasing manager, carpentry contractor, engineer, and architect.

Wood Consumption Behaviour

Timber species used by most respondents in this study varied from tropical hardwood or temperate hardwood to coniferous species. Unspecified domestic timber species accounted for a small proportion of the total volume used by the respondents. Industrial wood consumers tend to be diverse in terms of species preference.

Even though a large proportion of the respondents used *Pinus radiata*, only a few respondents clearly stated that their sources of supply are from New Zealand. Many respondents stated that they use a proportion of wood-based panels products made from *Pinus radiata*, however, they usually recognise the panel products by brand, manufacturers, or domestic grade rather than by species.

Distribution Channels

In this study, many industrial wood consumers stated that Chinese importers are their main source of supply, although many have also imported wood products from overseas suppliers directly. Language barrier, services, and a trustful relationship are the main reasons for them to choose Chinese importers.

Most respondents in the interior decoration and furniture sectors reported that they are involved in the domestic market, as well as exporting finished products to the United States, Europe, and Hong Kong. Most finished products are used in the residential end-use market.

9.6 Wood Consumption and Real GDP

In order to utilise the significant opportunity for a substantial increase in imports of wood products, the likely changes of the Chinese wood products market in relation to the real GDP were examined. The income and price elasticities analysis shows that the apparent consumption per thousand capita of all wood-based panels products (*fibreboard, plywood, particleboard, and veneer sheets*) will increase if the Chinese real GDP per capita increases. However, the apparent consumption per thousand capita of all unprocessed roundwood and all sawnwood is not dependent on either the changes in real GDP per capita or adjusted import or export unit prices.

The apparent consumption per thousand capita in the Chinese wood products market is very similar to international markets described in Buongiorno *et al.* (2001), except "sawnwood". According to the estimation in Buongiorno *et al.* (2001), the apparent consumption per thousand capita of sawnwood in the international market will increase if the GDP per capita increases, however, the apparent consumption per thousand capita of sawnwood in China does not show any response if the Chinese real GDP increases. One explanation is that the

proportion of wood framed housing construction in China is still relatively small. This suggests that the Chinese would prefer to use masonry-type construction as their most preferred building material if their real GDP per capita increases as indicated in USDA (2001b).

9.7 MACROENVIRONMENTAL DRIVERS

Although the results of the industrial consumer survey and many analysts suggest that the Chinese wood products market is a price-conscious market, the adjusted average import and export unit price elasticities are not statistically significant at the 5% level in this study. Hence, the consumption of wood products in China might be driven by other macroenvironmental drivers.

Terms of Trade and Exchange Rate

The exchange rate in China would influence the purchasing power of the industrial wood consumers. Although the Chinese currency has been relatively stable since 1994, the Chinese exchange rate policy has suddenly depreciated several times in the past to stimulate exports. New Zealand wood products exporters should closely examine China's terms of trade and adjust their prices in order to minimise the financial risk due to exchange rate.

Housing Market

Although the interest rate (bank rate) has lowered and total saving per capita has increased, lack of a secondary housing market, poor construction quality of the existing housing units, and rising unemployment have reduced people's confidence to own their houses. Rural migrants are likely to assist the development of the secondary market if they have equal opportunities to access all social services.

Wood framed houses are not very popular for residential purposes in China. However, there might be opportunities for wood framed housing in other end-uses, for example, holiday resorts, and second houses for urbanites. International and domestic visitor expenditures in China have increased. Chinese overseas travel must be authorised by the Chinese and overseas governments in order to obtain a visa, resulting in many Chinese preferring domestic rather than overseas travel. This suggests that wood framed holiday resorts or other tourist related facilities would be another opportunity for the New Zealand forestry sector.

Average household size has lowered to nearly 3 people per household and the Chinese population is projected to rapidly age in the next two decades. The demand for nuclear family units and independent elderly facilities is likely to increase in the next decade. In case of emergency, accessibility becomes a critical issue for the elderly. Low-density wood framed multi-storey retirement villages in rural areas might be a solution.

Trade Policy

Even though China has committed to liberalise the trade of many wood products by 2004, reduction of the 17% VAT is not included in China's WTO agreement. Value-added wood products will still have to face a cost disadvantage against domestic production and Russian wood products.

Technological and Environmental Drivers

Domestic wood processing technology has improved significantly over the past decade, driven by joint venture and foreign-owned companies through foreign direct investment (USDA, 2002). However, both native and fast growth plantation forests cannot supply large diameter logs, sawn timber production has declined dramatically as small diameter logs are

not economic for sawing. Hence, there is opportunity for imports of large diameter roundwood from New Zealand.

Environmental policy has restricted the annual harvest volume for industrial wood consumers. Large areas of plantation have been established over the last decade and plantations are likely to expand further as China has ratified the Kyoto Protocol as a developing country, and can gain carbon credits by establishing plantations. However, many analysts state that these plantations only produce small diameter logs, which can only be used for wood-based panel products or pulp. Hence, imports of sawn timber are likely to increase continuously.

9.8 SUMMARY

Exports of *Pinus radiata* industrial roundwood and kiln-dried sawn timber from New Zealand are the most significant opportunities for a substantial increase in exports to China under the current trade barriers and building codes. This opportunity has been supported by the demand analysis, interviews with the industry, and survey of the industrial wood consumers. More importantly, slow growing, small diameter domestic plantations are unlikely to compete with New Zealand in producing large diameter sawlogs. Unfortunately, the domestic production of wood-based panel products has dramatically increased in order to utilise these plantations. Despite the empirical study in Chapter 7 being unable to identify that the apparent consumption per capita of coniferous industrial roundwood and sawnwood increases if the Chinese real GDP per capita increases, this study concluded that sawn timber and industrial roundwood are the most important opportunities for the New Zealand forestry sector in exports to China in the next decade.

9.9 RECOMMENDATIONS

As China represents a significant opportunity for the New Zealand forestry sector, the sector should strategically promote and secure the use of New Zealand pine in the Chinese wood products market. Therefore, several strategies are recommended.

Price is the most important factor that will influence the Chinese industrial wood consumers to adopt a new wood product. On average, the freight cost for coniferous unprocessed roundwood and sawn timber accounts for nearly one-third of the total cost (c.i.f). Establishing offshore warehousing facilities would allow products to be shipped in larger vessels to offshore market, and lower the average unit freight cost.

In addition, offshore warehousing facilities and subsidiaries would develop a better relationship with overseas customers. Cartwright (2001) suggests that in-market presence is necessary for customers to feel that suppliers are real and credible to customers in the long-term. While the services of in-market distributors may be used, it is folly to assign total responsibility to them because customers will not have a direct linkage to their primary suppliers. Cartwright (2002) states that approaches to sales and marketing that rely on email and facsimile, with one or two market visits each year, are inherently weak when competitors have continuous market presence. If the New Zealand forestry sector is going to commit and recognise the market, in-market presence is needed.

Due to the fact that wood framed housing only accounted for a small proportion of total housing starts in China, the apparent consumption of sawn timber per capita is unlikely to increase. However, the apparent consumption of wood-panel products per capita is likely to increase if the Chinese real GDP per capita increases. As a result, the New Zealand forestry

sector should develop a long-term strategy to expand its market share of wood-based panel products in the Chinese wood products market despite the rising domestic production. The apparent consumption per thousand capita of all unprocessed roundwood and all sawnwood is not dependent on either the changes in real GDP per capita or adjusted import or export unit prices. Due to the average import and export unit prices being calculated from all industrial roundwood and sawn timber grades (i.e. a mixture of wood quality), it is recommended that a further study is needed on import and export price elasticities in terms of different industrial roundwood and sawn timber grades.

The demand for coniferous unprocessed roundwood and sawn timber might be increased through the popularity of wood framed housing. However, prospects for New Zealand pine are still uncertain. New Zealand should proactively be involved in redrafting the building and fire codes, and lobbying with the Chinese officials and the drafting committee in order to secure the use of New Zealand pine for structural purposes.

Moreover, New Zealand should also explore other market niches, for example, holiday resorts, holiday homes, and retirement villages where population density is not a constraint.

As marketing and negotiating require a huge effort by the New Zealand forestry sector, a more collective marketing approach is needed. Wood New Zealand Limited provided an example that collective marketing allows the sector to promote new products effectively and lobby at the governmental level. However, the demise of Wood New Zealand Limited exposes the difficulties that collective marketing has creating incentives for individual companies to participate and ensuring that the collective organisation is working toward directions supported by the majority of companies. In addition, some analysts suggest collective marketing with Australia would mutually benefit both countries.

Whether or not the New Zealand forestry sector endorses a collective marketing approach, a nationally and internationally recognised environmental certification standard is also urgently needed as many Chinese industrial wood consumers view environmental issues, such as certification from FSC[139], is an important factor as it is already being used in the market.

In order to promote New Zealand pine effectively in long-term, the New Zealand forestry sector should offer more scholarships and exchange programmes for Chinese architects, engineers, interior designers, and furniture designers to study the use of New Zealand pine.

The New Zealand forestry sector should target the coastal urbanities with the most consumption power and with lower transportation and distribution costs. Apart from promoting New Zealand pine to the industrial wood consumers, domestic consumers are also important for expanding the domestic market. Sponsoring movies and drama series with interior decoration and furniture made with New Zealand pine would probably create a trend for average households to choose products made from New Zealand pine for their renovations and to replace their existing furniture. Promotion to the domestic Chinese households is also important in increasing domestic demand as well as reducing industrial wood consumers exports to markets, which might compete with the New Zealand forestry sector.

[139] FSC refers to the Forest Stewartship Council.

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APPENDIXES

Appendix 2.1 Questionnaire: Wood Processors and Construction Contractors in the Housing Construction Sector.

WOOD PRODUCTS SURVEY: HOUSING CONSTRUCTION SECTOR

Information provided in this survey is strictly confidential. Results will be presented in an aggregated form only, and there is no risk of information being identified with your company. Thank you for your time and effort for completing this survey.

SECTION 1

1. Company name:	
2. Ownership:	State / Private / Collective / Shares / Other
3. Your name *(optional)*:	
4. Your occupation:	

5. Company address:	
State:	

6. Telephone:		**7.** Fax:	
8. E-mail:			

9. Please state your company's major business field(s). (*tick one or more boxes*)

☐ **Wood products import** (construction materials)

☐ **Wood processing** (construction materials)

☐ **Wholesale** (construction materials)

☐ **Retail** (construction materials)

☐ **Contracts tendering** (housing construction)

☐ **Housing development** → Have you been built any wood frame housing units?
☐ Yes ☐ No

☐ **Export** → *Please rank your three main destinations from 1 (most important) to 3 (least important):*
☐ E.U
☐ Japan
☐ U.S

☐ **Other** (*please specify*): _____

10. What is the size of your company in terms of annual turnover and employees? *(please tick one box in each column)*

	Annual Turnover			Employees
☐	Less than 10 million Yuan		☐	Less than 30 people
☐	10 to 50 million Yuan		☐	30 to 100 people
☐	More than 50 million Yuan		☐	More than 100 people

Please read the following carefully and select a group which best describe your organisation, and please tick ONE box only.

☐ **Wood frame housing construction.** *(Please answer* **Question 11A***)*

☐ **Concrete and steel housing construction.** *(Please answer* **Question 11B)**

☐ **Wood processing for housing construction.** *(Please answer* **Question 11A**)

☐ **Both Wood frame & Concrete and steel housing construction.** *(Please answer both* **Questions 11A & 11B***)*

11. (A) Please rate how important each of the following factors are in influencing you to adopt a new material for housing construction. (CIRCLE a number on each row, where 1 = least important and 9 = most important).

11. (B) In addition, please rate how important each of the following factors is in influencing you to adopt a new material for **temporary construction** *(such as concrete framing and site fencing). [Please WRITE this second score in the box (☐) on each row, where 1= least important and 9= most important.]*

Product Properties	*Least Important = 1*	*Most Important = 9*	
A: Wood Properties	1 2 3 4 5 6 7 8 9		☐
(For example: wood density; surface hardness; compressive strength; good nailing properties; light in weight, ease of handling; and smooth surface area (fine grain).			
B: Price	1 2 3 4 5 6 7 8 9		☐
(For example: freight cost; and material cost.)			
C: Availability	1 2 3 4 5 6 7 8 9		☐
(For example: availability of a regular product supply, and product favourites)			
D: Quality of Wood Products	1 2 3 4 5 6 7 8 9		☐
(For example: consistency of specified sawn dimensions; consistency of specified short-end diameter; and free of sapstain)			
E: Service	1 2 3 4 5 6 7 8 9		☐
(For example: reliability of delivery; provide technical assistance; provide credit and flexible payment terms)			
F: Environmental Issues	1 2 3 4 5 6 7 8 9		☐
(For example: Provide an official approved sustainability certificate.)			
G: Customer preferences	1 2 3 4 5 6 7 8 9		☐
H: Other users' experiences	1 2 3 4 5 6 7 8 9		☐

12. Are there any other factors that may influence you to use a new wood product, a new timber species, or new material for housing construction? *(please tick one box)*

☐	YES →	If **YES**, *please specify*:
☐	NO	

13. When first using a new material, a new wood-based product, or a new timber species for your operation, who made the final decision to use it in trials? *(e.g. director, architect, homebuyers, technicians, builders, plant manager, merchandising manager, engineers, designers, workers etc.)*

Final decision-maker: _____

Were any other people or groups involved during the decision-making?

Other involved in decision:

_____

_____

14. Please rank your three main types of customers for the products you produce, *from **1 (most important)** to **3 (least important)**:*

	Construction contractors
	Chinese construction materials wholesalers
	Chinese construction materials retailers
	Foreign owned construction material retailers or wholesalers
	Exhibition
	Chinese homebuyers (end-users)
	Foreign homebuyers (end-users)
	Overseas construction materials importers
	Chinese construction materials exporters
	Chinese wood products manufacturers *(wood processors)*
	Wood products trading centre
	China Import & Export Corporation
	Other (*please specify*):

SECTION 2
FOR USERS OF WOOD PRODUCTS ONLY.

If your company uses wood products, please answer Questions 15 to 18. Otherwise, please proceed to Section 3.

15. What type of wood products are you using in your operation? *(please tick appropriate boxes, and please indicate the approximate percentage of the total volume of wood products used in 2001 for each selected wood product)*

☐	A. Softwood logs (%)	☐	F. Hardwood logs (%)
☐	B. Softwood lumber (%)	☐	G. Hardwood lumber (%)
☐	C. Softwood veneers (%)	☐	H. Hardwood veneers (%)
☐	D. Softwood plywood (%)	☐	I. Hardwood plywood (%)
☐	E. Particleboard (%)	☐	J. Fibreboard & MDF (%)
☐	K. Other *(please specify):*		

16. In terms of material costs, what proportion of the material that you use is wood-based compared to other materials?

_____

17. What was the total volume of wood products your company used in 2001?

_____ m^3

18. How do you get your supply of wood products mentioned above in question 15? [*Please rank your three main supply channels from* ***1 (most important)*** *to* ***3 (least important)***]

	Overseas exporters or overseas forest companies
	China Import & Export Corporation
	Chinese wood products importers (State-owned)
	Chinese wood products importers (private)
	Chinese wood products manufacturers (wood processors)
	Chinese wood products wholesalers
	Chinese wood products retailers
	Exhibition
	Wood products trading centre
	Other (*please specify*):

19. Which timber species were you using in 2001? *(please tick appropriate boxes, and please indicate the approximate percentage of the total volume of wood products used in 2001 for each selected timber species)*

- ☐ American red oak (____ %)
- ☐ American white oak (____ %)
- ☐ American walnut (____ %)
- ☐ Chinese unspecified species (____ %)
- ☐ Chinese birch (____ %)
- ☐ Chinese fir (____ %)
- ☐ Chinese red oak (____ %)
- ☐ Chinese white oak (____ %)
- ☐ Chinese walnut (____ %)
- ☐ Douglas fir (____ %)
- ☐ Eucalyptus (____ %)
- ☐ European beech (____ %)
- ☐ Hemlock - Pacific Coast (____ %)
- ☐ Hemlock - Western (____ %)
- ☐ Mahogany (____ %)
- ☐ Pine – Maritime (____ %)
- ☐ Pine - New Zealand (____ %)
- ☐ Pine - radiata *(not from New Zealand)* (____ %)
- ☐ Pine - ponderosa (____ %)
- ☐ Serbian spruce, or other coniferous from Russia (____ %)
- ☐ Pine - Southern yellow (____ %)
- ☐ Poplar (____ %)
- ☐ Rosewood (____ %)
- ☐ Rubber wood (____ %)
- ☐ Spruce - Sitka (____ %)
- ☐ Teak
- ☐ Other *(please specify):* _____ (___ %)

SECTION 3
FOR DEVELOPERS AND CONTRACTORS ONLY.

If your organisation is involved in housing development or contracts tendering, please answer Questions 20 to 28. Otherwise, please proceed to Section 4.

20. Please select and provide an approximate percentage of each of the following types of housing units that you built in 2001 in terms of floor spaces. *(please tick one or more boxes)*

☐ State-owned housing units (____ %) ☐ Commercial housing units (____ %)
☐ Other *(please specify):* _____ (____ %)

21. Please select the type of house(s) that you built, and indicate the number of completed units in the past 2 years.

Type of Houses	*Number of completed units in the past 2 years*
☐ Steel & concrete	_____ units
☐ Traditional (Post and brick)	_____ units
☐ Wood frame (solid wood)	_____ units
☐ Other *(please specify):* _____	_____ units

22. Please indicate the relative preference for the following structural materials that your company preferred for housing construction, where 1 = least preferred and 9 = most preferred.

	1= Low preference								**9= High preference**
• Steel	1	2	3	4	5	6	7	8	9
• Concrete	1	2	3	4	5	6	7	8	9
• Solid wood	1	2	3	4	5	6	7	8	9

SECTION 4

23. Have you ever heard about wood products made from New Zealand pine? (Please tick one box.)

☐ **NO** ---> If you HAVE NOT been using or heard about New Zealand pine wood products before, you have completed this survey.

***** THANK YOU FOR COMPLETING THIS SURVEY! *****

Please return this survey to: **New Zealand School of Forestry,**
University of Canterbury,
Private Bag 4800, Christchurch 8020,
NEW ZEALAND
Fax: +64-3-364 2124

☐ **YES** --> If you HAVE been using, or have heard about, New Zealand pine wood products, **please continue**.

24. Do you have any difficulties in contacting New Zealand pine suppliers? *(tick one box)*

☐	**Yes**	☐	**No** *(please go to next question)*

If **YES**, what kinds of difficulties have you faced. *(please tick appropriate boxes)*

☐	Suppliers do not have the product	☐	Do not know how to find suppliers
☐	Communication problem	☐	No response from suppliers
☐	Other (*please state*):		

25. Do you receive sufficient information on wood products made from New Zealand pine? (For example, information on wood properties, drying method, preservative treatment, etc.) [*please tick one box*]

☐	No	If **NO**, please state what information is lacking.
☐	Yes	

26. What are your opinions about wood products made from New Zealand pine in terms of:

- **Price:** *(tick on box)*

☐ Cheap	☐ Reasonable	☐ Expensive

- **Environmental Issues:** *(tick one box in each row)*

New Zealand pine is sourced from sustainably managed forests	☐	Yes	☐	No	☐	Not sure
It is easy to obtain sustainability certificates	☐	Yes	☐	No	☐	Not sure

- **Wood Properties:** *(tick one box in each row)*

= Strength (for construction purposes)	☐	poor	☐	reasonable	☐	excellent
= Density (for construction purposes)	☐	poor	☐	reasonable	☐	excellent
= Colour	☐	poor	☐	reasonable	☐	excellent
= Wood pattern	☐	poor	☐	reasonable	☐	excellent
= Surface smoothness	☐	poor	☐	reasonable	☐	excellent
= Machinability	☐	poor	☐	reasonable	☐	excellent
= Moisture content	☐	poor	☐	reasonable	☐	excellent

27. Finally, have your ever experienced any problems in using New Zealand pine products? *(please tick one box)*

☐	YES →	If **YES**, *please specify (e.g. availability, quality, physical and mechanical properties, technology, policy, and service)*:
☐	NO	

******** **THANK YOU FOR COMPLETING THIS SURVEY** **********

Please return this survey to:

New Zealand School of Forestry,
University of Canterbury,
Private Bag 4800, Christchurch 8020,
NEW ZEALAND
Fax: +64-3-364 2124

Appendix 2.2 Questionnaire: Interior Decorating Material Manufacturers in the Interior Decoration Sector.

WOOD PRODUCTS SURVEY: INTERIOR DECORATION SECTOR

Information provided in this survey is strictly confidential. Results will be presented in an aggregated form only, and there is no risk of information being identified with your company. Thank you for your time and effort for completing this survey.

1. Company name:	
2. Ownership:	State / Private / Collective / Shares / Other
3. Your name *(optional)*:	
4. Your occupation:	

5. Company address:	
Province:	

6. Telephone:		**7.** Fax:	
8. E-mail:			

9. Please state your company's major business field(s). (*tick one or more boxes*)

☐ **Wood products import** (interior decoration materials)

☐ **Wood processing** (interior construction materials)

→ *Please rank your main market segments from 1 (most important) to 3 (least important):*

- ☐ Hotel, restaurants, and shopping malls
- ☐ Commercial (offices)
- ☐ Residential
- ☐ Leisure, and recreation facilities
- ☐ Other (*please specify*): _____

☐ **Wholesale** (interior decoration materials)

☐ **Retail** (interior decoration materials)

☐ **Export** (interior decoration materials)

→ *Please rank your three main final destinations from 1 (most important) to 3 (least important):*

- ☐ E.U
- ☐ Japan
- ☐ U.S

10. What are your main products? (*For example, if your organisation is involved in **producing interior decoration materials**, your main products would be: mouldings, decorative boards, doors, frames, skirting, floorings, wardrobes, etc. If your organisation is involved in **tendering interior decoration contracts**, your main products would be carpentry, masonry, plumbing, etc.) Please specify:*

_____

_____

_____

11. What proportion of your business is carpentry related versus other operations in terms of sales?

_____

12. What is the size of your company in terms of annual turnover and employees? *(please tick one box in each column)*

	Annual Turnover			Employees
☐	Less than 10 million Yuan		☐	Less than 30 people
☐	10 to 50 million Yuan		☐	30 to 100 people
☐	More than 50 million Yuan		☐	More than 100 people

13. Please rank your three main types of customers for the products you produce, *from 1 **(most important)** to 3 **(least important)**:*

	Interior decoration contractors
	Chinese interior decoration materials wholesalers
	Exhibition
	Foreign owned interior decoration material retailers or wholesalers
	Property owners
	Overseas interior decoration materials importers
	Chinese interior decoration materials retailers
	Chinese interior decoration materials exporters
	Chinese wood products manufacturers (wood processors)
	Wood products trading centre
	China Import & Export Corporation
	Other (*please specify*):

14. What type of wood products are you using in your operation? *(please tick appropriate boxes, and please indicate the approximate percentage of the total volume of wood products used in 2001 for each selected wood product)*

☐	A. Softwood logs (%)	☐	F. Hardwood logs (%)
☐	B. Softwood lumber (%)	☐	G. Hardwood lumber (%)
☐	C. Softwood veneers (%)	☐	H. Hardwood veneers (%)
☐	D. Softwood plywood (%)	☐	I. Hardwood plywood (%)
☐	E. Particleboard (%)	☐	J. Fibreboard & MDF (%)
☐	K. Other *(please specify)*:		

15. Which timber species were you using in 2001? *(please tick appropriate boxes, and please indicate the approximate percentage of the total volume of wood products used in 2001 for each selected timber species)*

- ☐ American red oak (____ %)
- ☐ American white oak (____ %)
- ☐ American walnut (____ %)
- ☐ Chinese unspecified species (____ %)
- ☐ Chinese birch (____ %)
- ☐ Chinese fir (____ %)
- ☐ Chinese red oak (____ %)
- ☐ Chinese white oak (____ %)
- ☐ Chinese walnut (____ %)
- ☐ Douglas fir (____ %)
- ☐ Eucalyptus (____ %)
- ☐ European beech (____ %)
- ☐ Hemlock - Pacific Coast (____ %)
- ☐ Hemlock - Western (____ %)
- ☐ Mahogany (____ %)
- ☐ Pine – Maritime (____ %)
- ☐ Pine - New Zealand (____ %)
- ☐ Pine - radiata *(not from New Zealand)* (____ %)
- ☐ Pine - ponderosa (____ %)
- ☐ Serbian spruce, or other coniferous from Russia (____ %)
- ☐ Pine - Southern yellow (____ %)
- ☐ Poplar (____ %)
- ☐ Rosewood (____ %)
- ☐ Rubber wood (____ %)
- ☐ Spruce - Sitka (____ %)
- ☐ Teak
- ☐ Other *(please specify):* _____ (___ %)

16. What proportion of material that your operation used is wood-based versus other in terms of material costs?

_____

17. What was the volume of wood products your company used in 2001?

_____ m^3

18. How do you get your supply of wood products mentioned above in question 17? [*Please rank your three main supply channels from **1 (most important)** to **3 (least important)***]

	Overseas exporters or overseas forest companies
	China Import & Export Corporation
	Chinese interior decoration materials importers (State-owned)
	Chinese interior decoration materials importers (private)
	Chinese wood products manufacturers (wood processors)
	Chinese interior decoration materials wholesalers
	Chinese interior decoration materials retailers
	Exhibition
	Wood products trading centre
	Other (*please specify*):

19. When first using a new wood-based product or timber species in your operation, who made the final decision to use it in trials? *(e.g. director, property owners, carpenters, architects, builders, technicians, plant manager, merchandising manager, engineers, and designers, etc.)*

Final decision-maker: _____

Were any other people or groups involved during the decision-making?

Other involved in decision: _____

_____

20. How important are each of the following factors in influencing you to adopt a new wood-based product or timber species in your operation? (*please CIRCLE a number on each row, where 1 = least important to 9 = most important)*

FACTORS *Least Important = 1* *Most Important = 9*

A: Wood Properties 1 2 3 4 5 6 7 8 9
(For example: wood density; surface hardness; compressive strength; good nailing properties; light in weight, ease of handling; and smooth surface area (fine grain).

B: Price 1 2 3 4 5 6 7 8 9
(For example: freight cost; and material cost.)

C: Availability 1 2 3 4 5 6 7 8 9
(For example: availability of a regular product supply, and product favourites)

D: Quality of Wood Products 1 2 3 4 5 6 7 8 9
(For example: consistency of specified sawn dimensions; consistency of specified short-end diameter; and free of sapstain)

E: Service 1 2 3 4 5 6 7 8 9
(For example: reliability of delivery; provide technical assistance; provide credit and flexible payment terms)

F: Environmental Issues 1 2 3 4 5 6 7 8 9
(For example: Provide an official approved sustainability certificate.)

G: Customer preferences 1 2 3 4 5 6 7 8 9

H: Other users' experiences 1 2 3 4 5 6 7 8 9

21. Are there any other factors that may influence you to adopt a new wood-based product or timber species in your operation? *(please tick one box)*

☐	YES →	If **YES**, *please specify*:
☐	NO	

22. Have you ever heard about wood products made from New Zealand pine?

☐ **NO** ---> If you HAVE NOT been using or heard about New Zealand pine wood products before, you have completed this survey.

THANK YOU FOR COMPLETING THIS SURVEY!

Please return this survey to: **Kenneth Tsang**
New Zealand School of Forestry,
University of Canterbury,
Private Bag 4800, Christchurch 8020,
NEW ZEALAND
Fax: +64-3-364 2124

☐ **YES** --> If you HAVE been using, or have heard about, New Zealand pine wood products, please continue.

23. Do you have any difficulties in contacting New Zealand pine suppliers? *(tick one box)*

☐	**Yes** ↓	☐	**No** *(please go to next question)*

If **YES**, what kinds of difficulties have you faced. *(please tick appropriate boxes)*

☐	Suppliers do not have the product	☐	Do not know how to find suppliers
☐	Communication problem	☐	No response from suppliers
☐	Other (*please state*):		

24. Can you receive enough information on wood products made from New Zealand pine? (For example, information on wood properties, drying method, preservative treatment, etc.) [*please tick one box*]

☐	No →	If **NO**, please state what information is lacking.
☐	Yes	

25. What are your opinions about wood products made from New Zealand pine in terms of:

- **Price:** *(tick one box)*

☐	Cheap	☐	Reasonable	☐	Expensive

- **Environmental Issues:** *(tick one box in each row)*

➢ New Zealand pine is sourced from sustainably managed forests.	☐	Yes	☐	No	☐	Not sure
➢ It is easy to obtain sustainability certificates.	☐	Yes	☐	No	☐	Not sure

- **Wood Properties:** *(tick one box in each row)*

= Strength (for furniture purposes)	☐	poor	☐	reasonable	☐	excellent
= Density (for furniture purposes)	☐	poor	☐	reasonable	☐	excellent
= Colour	☐	poor	☐	reasonable	☐	excellent
= Wood pattern	☐	poor	☐	reasonable	☐	excellent
= Surface smoothness	☐	poor	☐	reasonable	☐	excellent
= Machinability	☐	poor	☐	reasonable	☐	excellent
= Moisture content	☐	poor	☐	reasonable	☐	excellent

26. Finally, have your ever experienced any problems using New Zealand pine products? *(tick one box)*

☐	YES →	If **YES,** *please specify (e.g. availability, quality, physical and mechanical properties, technology, policy, and service)*:
☐	NO	

********** **THANK YOU FOR COMPLETING THIS SURVEY**********

Please return this survey to: **New Zealand School of Forestry,**
University of Canterbury,
Private Bag 4800, Christchurch 8020,
NEW ZEALAND
Fax: +64-3-364 2124

Appendix 2.3 Questionnaire: Furniture Manufacturers in the Furniture Sector.

WOOD PRODUCTS SURVEY: FURNITURE SECTOR

Information provided in this survey is strictly confidential. Results will be presented in an aggregated form only, and there is no risk of information being identified with your company. Thank you for your time and effort for completing this survey.

1. Company name:	
2. Ownership:	State / Private / Collective / Shares / Other
3. Your name *(optional)*:	
4. Your occupation:	

5. Company address:	
Province:	

6. Telephone:		**7.** Fax:	
8. E-mail:			

9. Please state your company's major business field(s). (*tick one or more boxes*)

☐ **Wood products import** (furniture components)
☐ **Wood processing** (furniture components)
☐ **Wood products wholesale** (furniture components)
☐ **Wood products retail** (furniture components)
☐ **Furniture manufacturing**

→ *Please rank your main market segments from 1 (most important) to 3 (least important):*
☐ Hotel, restaurants, and shopping malls
☐ Commercial (offices)
☐ Residential
☐ Other (*please specify*): _____

☐ **Furniture export**

→ *Please rank your main destinations from 1 (most important) to 3 (least important):*
☐ E.U
☐ Japan
☐ U.S
☐ Other (*please specify*): _____

10. What are your main products (*for example, dining room furniture, bedroom furniture, or furniture joinery*)? *Please specify:*

_____
_____

11. In terms of sales, what proportion of your business is wooden furniture compared to furniture made from other materials?

_____

12. What is the size of your company in terms of annual turnover and employees? *(please tick one box in each column)*

	Annual Turnover			Employees
☐	Less than 10 million Yuan		☐	Less than 30 people
☐	10 to 50 million Yuan		☐	30 to 100 people
☐	More than 50 million Yuan		☐	More than 100 people

13. Please rank your three main type of customers for the products you produce *(in terms of sales), from **1 (most important)** to **3 (least important):***

	China Import & Export Corporation
	Overseas furniture importers
	Overseas furniture retailers
	Exhibition
	Chinese furniture buyers(end-users)
	Chinese furniture wholesalers
	Chinese furniture retailers
	Chinese furniture exporters
	Chinese wood products manufacturers (wood processors)
	Wood products trading centre
	Other *(please specify)*:

14. What type of wood products are you using in your operation? *(please tick appropriate boxes, and please indicate the approximate percentage of the total volume of wood products used in 2001 for each selected wood product)*

☐	A. Softwood logs (%)	☐	F. Hardwood logs (%)
☐	B. Softwood lumber (%)	☐	G. Hardwood lumber (%)
☐	C. Softwood veneers (%)	☐	H. Hardwood veneers (%)
☐	D. Softwood plywood (%)	☐	I. Hardwood plywood (%)
☐	E. Particleboard (%)	☐	J. Fibreboard & MDF (%)
☐	K. Other *(please specify):*		

15. Which timber species were you using in 2001? *(please tick appropriate boxes, and please indicate the approximate percentage of the total volume of wood products used in 2001 for each selected timber species)*

☐ American red oak (____ %)
☐ American white oak (____ %)
☐ American walnut (____ %)
☐ Chinese unspecified species (____ %)
☐ Chinese birch (____ %)
☐ Chinese fir (____ %)
☐ Chinese red oak (____ %)
☐ Chinese white oak (____ %)
☐ Chinese walnut (____ %)
☐ Douglas fir (____ %)
☐ Eucalyptus (____ %)
☐ European beech (____ %)
☐ Hemlock - Pacific Coast (____ %)
☐ Hemlock - Western (____ %)
☐ Mahogany (____ %)
☐ Pine – Maritime (____ %)
☐ Pine - New Zealand (____ %)
☐ Pine - radiata *(not from New Zealand)* (____ %)
☐ Pine - ponderosa (____ %)
☐ Serbian spruce, or other coniferous from Russia (____ %)
☐ Pine - Southern yellow (____ %)
☐ Poplar (____ %)
☐ Rosewood (____ %)
☐ Rubber wood (____ %)
☐ Spruce - Sitka (____ %)
☐ Teak
☐ Other *(please specify):*
_____ (___ %)

16. What proportion of the material that you use is wood-based in terms of material costs?

_____

17. What was the total volume of wood products your company used in 2001?

_____ m^3

18. How do you get your supply of wood products mentioned above in question 14? [*Please rank your three main supply channels from* ***1 (most important)*** *to* ***3 (least important)***]

	Overseas exporters or overseas forest companies
	China Import & Export Corporation
	Chinese wood products importers (State-owned)
	Chinese wood products importers (private)
	Chinese wood products manufacturers (wood processors)
	Chinese wood products wholesalers
	Chinese wood products retailers
	Exhibition
	Wood products trading centre
	Other (*please specify*):

19. When first using a new wood-based product or timber species in your operation, who made the final decision to use it in trials? *(e.g. director, technicians, plant manager, merchandising manager, engineers, and designers, etc.)*

Final decision maker: _____

Were any other people or groups involved during the decision-making?

Other involved in decision: _____

_____

20. How important are each of the following factors in influencing you to adopt a new wood-based product or timber species in your operation? *(please CIRCLE a number on each row, where 1 = least important to 9 = most important)*

FACTORS *Least Important = 1* *Most Important = 9*

A: Wood Properties 1 2 3 4 5 6 7 8 9
(For example: wood density; surface hardness; compressive strength; good nailing properties; light in weight, ease of handling; and smooth surface area (fine grain).

B: Price 1 2 3 4 5 6 7 8 9
(For example: freight cost; and material cost.)

C: Availability 1 2 3 4 5 6 7 8 9
(For example: availability of a regular product supply, and product favourites)

D: Quality of Wood Products 1 2 3 4 5 6 7 8 9
(For example: consistency of specified sawn dimensions; consistency of specified short-end diameter; and free of sapstain)

E: Service 1 2 3 4 5 6 7 8 9
(For example: reliability of delivery; provide technical assistance; provide credit and flexible payment terms)

F: Environmental Issues 1 2 3 4 5 6 7 8 9
(For example: Provide an official approved sustainability certificate.)

G: Customer preferences 1 2 3 4 5 6 7 8 9

H: Other users' experiences 1 2 3 4 5 6 7 8 9

21. Are there any other factors that may influence you to adopt a new wood-based product or timber species in your operation? *(please tick one box)*

☐	YES	If **YES**, *please specify*:
☐	NO	

22. Have you ever heard about wood products made from New Zealand pine?

☐ **NO** ---> If you HAVE NOT been using or heard about New Zealand pine wood products before, you have completed this survey.

THANK YOU FOR COMPLETING THIS SURVEY!

Please return this survey to: **New Zealand School of Forestry,**
University of Canterbury,
Private Bag 4800, Christchurch 8020,
NEW ZEALAND
Fax: +64-3-364 2124

☐ **YES** --> If you HAVE been using, or have heard about, New Zealand pine wood products, ***please continue.***

23. Do you have any difficulties in contacting New Zealand pine suppliers? *(tick one box)*

☐	**Yes**	☐	**No** *(please go to next question)*

If **YES**, what kinds of difficulties have you faced. *(please tick appropriate boxes)*

☐	Suppliers do not have the product	☐	Do not know how to find suppliers
☐	Communication problem	☐	No response from suppliers
☐	Other (*please state*):		

24. Do you receive sufficient information on wood products made from New Zealand pine? (For example, information on wood properties, drying method, preservative treatment, etc.) [*please tick one box*]

☐	No	If **NO**, please state what information is lacking.
☐	Yes	

25. What are your opinions about wood products made from New Zealand pine in terms of:

- **Price:** *(tick one box)*

☐	Cheap	☐	Reasonable	☐	Expensive

- **Environmental Issues:** *(tick one box in each row)*

➢ New Zealand pine is sourced from sustainably managed forests.	☐	Yes	☐	No	☐	Not sure
➢ It is easy to obtain sustainability certificates.	☐	Yes	☐	No	☐	Not sure

- **Wood Properties:** *(tick one box in each row)*

= Strength (for furniture purposes)	☐	poor	☐	reasonable	☐	excellent
= Density (for furniture purposes)	☐	poor	☐	reasonable	☐	excellent
= Colour	☐	poor	☐	reasonable	☐	excellent
= Wood pattern	☐	poor	☐	reasonable	☐	excellent
= Surface smoothness	☐	poor	☐	reasonable	☐	excellent
= Machinability	☐	poor	☐	reasonable	☐	excellent
= Moisture content	☐	poor	☐	reasonable	☐	excellent

26. Finally, have your ever experienced any problems using New Zealand pine products? *(please tick one box)*

☐	YES →	If **YES**, *please specify (e.g. availability, quality, physical and mechanical properties, technology, policy, and service)*:
☐	NO	

********** **THANK YOU FOR COMPLETING THIS SURVEY** **********

Please return this survey to: **New Zealand School of Forestry,**
University of Canterbury,
Private Bag 4800, Christchurch 8020,
NEW ZEALAND
Fax: +64-3-364 2124

Appendix 2.4 Definition: Selected Wood Products from FAOSTAT Online Database.

SPECIES

- **Coniferous**

All woods derived from trees classified botanically as Gymnospermae - e.g. fir (Abies), parana pine (Araucaria), deodar (Cedrus), ginkgo (Ginkgo), larch (Larix), spruce (Picea), pine, chir, kail (Pinus), etc. These are generally referred to as softwoods.

- **Non-Coniferous**

All woods derived from trees classified botanically as Angiospermae - e.g., maple (Acer), alder (Alnus), ebony (Diospyros), beech (Fagus), lignum vitae (Guiaicum), poplar (Populus), oak (Quercus), sal (Shorea), teak (Tectona), casuarina (Casuarina), etc. These are generally referred to as broadleaved or hardwoods.

SELECTED WOOD PRODUCTS

- **Industrial Roundwood**

The commodities included are sawlogs or veneer logs, pulpwood, other industrial roundwood and, in the case of trade, also chips and particles and wood residues. Figures are given in solid volume of roundwood (or roundwood equivalent) without bark.

- **Sawnwood**

Sawnwood, unplaned, planed, grooved, tongued, etc., sawn lengthwise, or produced by a profile-chipping process (e.g. planks, beams, joists, boards, rafters, scantlings, laths, boxboards, "lumber", sleepers, etc.) and planed wood which may also be finger jointed, tongued or grooved, chamfered, rabbeted, V-jointed, beaded, etc. Wood flooring is excluded. With few exceptions, sawnwood exceeds 5 mm. in thickness. Figures are given in solid volume.

- **Fibreboard** (fibre building board)

A panel manufactured from fibres of wood or other ligno-cellulosic materials with the primary bond deriving from the felting of the fibres and their inherent adhesive properties. Bonding materials and/or additives may be added. It is usually flat pressed but may also be moulded. (Similar products made from pieces of wood, wood flour or other ligno-cellulosic material with added binders are excluded - as are, for example, boards of gypsum or other mineral material). The aggregate includes fibreboard compressed (Hardboard and Medium Density Fibreboard) and insulating board. Figures are given in solid volume.

- **Particleboard**

A sheet material manufactured from small pieces of wood or other ligno-cellulosic materials (e.g. chips, flakes, splinters, strands, shreds, schives, etc.) agglomerated by use of an organic binder together with one or more of the following agents: heat, pressure, humidity, a catalyst, etc. (Flaxboard is included. Wood wool and other particle boards, with inorganic binders, are excluded). Figures are given in solid volume.

- **Plywood**

Plywood, veneer plywood, core plywood including veneered wood, blockboard, laminboard and battenboard. Other plywood such as cellular board and composite plywood. Veneer plywood is plywood manufactured by bonding together more than two veneer sheets. The grain of alternate veneer sheets is crossed generally at right angles. Core plywood is plywood whose core (i.e. central layer, generally thicker than the other plies) is solid and consists of narrow boards, blocks or strips of wood placed side by side, which may or may not be glued together. (This item includes veneered wood in sheets or panels in which a thin veneer of wood is affixed to a base, usually of inferior wood, by glueing under pressure). Cellular board is a plywood with a core of cellular construction while composite plywood is a plywood with core or certain layers made of material other than solid wood or veneers. Figures are given in solid volume.

- **Veneer Sheets**

Thin sheets of wood of uniform thickness, rotary cut, sliced or sawn, for use in plywood, laminated construction, furniture, veneer containers, etc. In production, the quantity given excludes veneer sheets used for plywood production within the country. Figures are given in solid volume.

- **Wood-Based Panels**

The aggregate includes the following commodities: veneer sheets, plywood, particle board and fibreboard compressed or non-compressed. Starting from 1995 the *Fibreboard, Compressed* has been disaggregated in *Hardboard* and *Medium density fibreboard (MDF)*; and the *Fibreboard, non-compressed* has been re-labelled *Insulating board*. Figures are given in solid volume.

- **Other industrial roundwood**

Roundwood used for tanning, distillation, match blocks, gazogenes, poles, piling, posts, pitprops, etc. (Note: "OTHER INDUSTRIAL ROUNDWOOD" include pitprops.) Figures are given in solid volume of roundwood (or roundwood equivalent) without bark.

- **Sawnwood + Sleepers**

The aggregate includes sawnwood and sleepers, coniferous or non-coniferous. Figures are given in solid volume.

- **Sawlogs + Veneer Logs**

Logs whether or not roughly squared, to be sawn (or chipped) lengthwise for the manufacture of sawnwood or railway sleepers (ties). Shingle bolts and stave bolts are included. Logs for production of veneer, mainly by peeling or slicing. Match billets are included, as are special growth (burls, roots, etc.) used for veneers.

Appendix 3.1 The Average Private (Commercial) Housing Prices in China between 1998 and 1999 by Province or City.

	TOTAL VALUE SOLD (in billion RMB)		FLOOR SPACE Proceedings (in million m2)		FLOOR SPACE Completed (in million m2)		FLOOR SPACE Sold (in million m2)		AVERAGE PRICE SOLD (in RMB/ m2)	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
NATIONAL	**251.3**	**265.5**	**362.2**	**410.3**	**141.3**	**161.9**	**108.3**	**118.8**	**2,321**	**2,235**
CENTRAL NORTH	**33.7**	**44.8**	**49.8**	**60.9**	**17**	**23.6**	**11**	**13.1**	**3,066**	**3,409**
Beijing	21.4	30.8	21.1	24.5	5.9	9.1	3.8	4.8	5,687	6,344
Tianjin	5.8	5.8	10.9	12.7	3.6	4.3	2.3	2.5	2,485	2,344
Hebei	4.1	5.2	10.1	13.4	4.3	6.3	2.7	3.5	1,512	1,488
Shanxi	1.2	1	4.7	6.8	1.8	2	1.2	0.9	1,043	1,163
Inner Mongolia	1.2	2	2.9	3.5	1.4	1.9	1	1.5	1,153	1,394
NORTH-EASTERN	**18.6**	**22.7**	**28.2**	**32.8**	**14.8**	**17.3**	**9.9**	**11**	**1,883**	**2,056**
Liaoning	12	14.4	17.5	19.2	8.5	10.4	5.8	6.5	2,077	2,213
Jilin	2.2	2.7	3.9	5.3	2.4	2.7	1.4	1.5	1,493	1,747
Heilongjiang	4.5	5.6	6.7	8.3	3.9	4.2	2.7	3	1,672	1,870
EASTERN	**108.1**	**107.7**	**141**	**155.3**	**57.7**	**63.3**	**48.3**	**51.3**	**2,238**	**2,098**
Shanghai	39.9	33.9	37	36.9	12.4	11.3	10.6	11.3	3,774	3,004
Jiangsu	21	23.2	28.8	33	14.7	17.9	11.8	13.1	1,785	1,774
Zhejiang	21.5	21.5	24.8	28.4	11	11.3	10.3	10.1	2,087	2,122
Anhui	4.5	4.9	9.3	10.3	4.6	4.7	3.5	3.7	1,286	1,310
Fujian	10.5	11.7	17.3	19.9	4.5	5.4	4.4	4.6	2,379	2,567
Jiangxi	1.4	1.6	5.1	5.4	2	2.1	1.5	1.6	907	995
Shandong	9.2	10.9	18.7	21.5	8.5	10.6	6.2	6.9	1,497	1,571
SOUTHERN	**67.7**	**62.3**	**91.1**	**97.8**	**31.9**	**33**	**23.5**	**23.9**	**2,881**	**2,602**
Henan	2.7	3.1	8.6	10.5	3.4	4	2.6	2.8	1,038	1,109
Hubei	7.1	5.7	12.3	14.2	5.7	5.8	3.8	4	1,850	1,420
Hunan	1.9	2.9	6.8	7.8	2.7	3.4	1.7	2.5	1,136	1,170
Guangdong	53	48.6	57.6	59.7	18	18.4	13.5	13.3	3,916	3,656
Guangxi	2.6	1.5	4.8	4	1.9	1.2	1.6	1.1	1,600	1,423
Hainan	0.3	0.5	1	1.6	0.2	0.2	0.2	0.3	1,809	1,578
SOUTH-WESTERN	**17.8**	**21**	**36.6**	**45.5**	**14.1**	**16.6**	**11.8**	**13.3**	**1,506**	**1,580**
Chongqing	5.6	5.9	12.2	12.9	4.2	4.4	3.6	3.6	1,543	1,624
Sichuan	7.1	8.7	15.5	21	6.3	7.8	5.3	5.9	1,344	1,457
Guizhou	1.2	1.6	3.2	4	1.2	1.2	0.9	1.1	1,412	1,470
Yunnan	3.9	4.8	5.5	7.6	2.4	3.2	2.1	2.6	1,905	1,863
Tibet	0	-	0.2	0	0	0	0	0	1,111	-
NORTH-WESTERN	**5.5**	**7.2**	**15.5**	**17.9**	**5.6**	**8.2**	**3.8**	**6.1**	**1,436**	**1,176**
Shaanxi	2.4	3.9	8	9.7	2.2	4.5	1.7	3.6	1,405	1,087
Gansu	1	0.7	2.8	2.7	1.1	0.9	0.7	0.7	1,408	1,092
Qinghai	0.2	0.3	1.2	1.2	0.5	0.6	0.1	0.2	1,301	1,184
Ningxia	0.8	1	1.6	1.7	1	1	0.5	0.7	1,439	1,399
Xinjiang	1.2	1.3	1.9	2.6	0.8	1.1	0.8	0.9	1,553	1,422

Source: China State Statistical Bureau (2000).

Appendix 3.2 China: Total Imports of Wood Products by Value (c.i.f *in million of US$*), **1996 – 2001.**[140]

HS	Description	1997	1998	1999	2000	2001
4401	FUEL WOOD IN LOGS ETC; WOOD IN CHIPS, ETC.	4.6	4.2	9.3	6.7	4.9
4402	WOOD CHARCOAL, WHETHER OR NOT AGGLOMERATED	0.3	0.6	0.6	0.7	3.2
4403	WOOD IN THE ROUGH, STRIPPED OR NOT OF SAPWOOD ETC	551.2	694.4	918.5	1,565.4	1,649.3
4404	HOOPWOOD; SPLIT POLES; PICKETS AND STAKES ETC	7.5	9.2	11.5	19.2	14.3
4405	WOOD WOOL (EXCELSIOR); WOOD FLOUR	1.3	1.1	0.9	0.5	0.8
4406	RAILWAY OR TRAMWAY SLEEPERS (CROSS-TIES) OF WOOD	0.1	0.5	2.6	3.5	2.5
4407	WOOD SAWN OR CHIPPED LENGTH, SLICED ETC, OV6MM TH	224.8	301.4	505.8	862.1	977.7
4408	VENEER SHEETS ETC, NOT OVER 6 MM THICK	143.3	147.1	191.8	213.8	144.3
4409	WOOD, CONTINUOUSLY SHAPED (TONGUED, GROOVED ETC.)	7.3	12.4	16.1	9.4	7.4
4410	PARTICLE BOARD & SIMILAR BOARD OF WOOD ETC.	24.5	29.6	39.4	60.5	72.0
4411	FIBERBOARD OF WOOD OR OTHER LIGNEOUS MATERIALS	86.5	120.7	175.9	242.5	294.2
4412	PLYWOOD, VENEERED PANELS & SIMILAR LAMINATED WOOD	574.8	610.4	464.7	457.5	352.0
4413	DENSIFIED WD BLOCKS/PLATES/STRIPS/PROFILE SHAPES	28.0	45.4	38.9	23.6	13.6
4414	WOODEN FRAMES PAINTINGS, PHOTOGRAPHS, MIRRORS, ETC	0.9	0.7	0.8	0.7	0.5
4415	PACKINGS ETC, WOOD; PALLETS, COLLARS ETC, OF WOOD	1.4	1.9	1.3	4.0	2.0
4416	CASKS, BARRELS, VATS, ETC. AND PARTS, OF WOOD	0.5	0.5	0.4	0.9	0.8
4417	TOOLS/TOOL & BROOM BODIES ETC SHOE LAST/TREES WOOD	2.0	1.3	1.2	1.3	1.8
4418	BUILDERS' JOINERY AND CARPENTRY OF WOOD	20.4	49.6	35.9	20.8	11.2
4419	TABLEWARE AND KITCHENWARE, OF WOOD	7.0	2.3	1.3	0.8	1.1
4420	WOOD MARQUETRY ETC; JEWEL CASE ETC & WD FURN NESOI	1.0	1.4	1.0	1.2	1.5
4421	ARTICLES OF WOOD, NESOI	14.3	24.6	25.7	29.2	13.5
	TOTAL	1,702	2,059	2,444	3,524	3,568

Source: World Trade Atlas: *China Customs.*

[140] For the year ended July

Appendix 3.3 China: Total Imports of Wood Products by Quantity (*in m^3* or *in thousand kg*), 1997-2001.[141]

HS	Description	1997	1998	1999	2000	2001	Unit
4401	FUEL WOOD IN LOGS ETC; WOOD IN CHIPS, ETC.	80,781	72,410	111,590	81,264	25,824	KG
4402	WOOD CHARCOAL, WHETHER OR NOT AGGLOMERATED	979	2,090	3,684	11,107	39,244	KG
4403	WOOD IN THE ROUGH, STRIPPED OR NOT OF SAPWOOD ETC	3,758	4,872	7,357	12,553	15,085	CBM
4404	HOOPWOOD; SPLIT POLES; PICKETS AND STAKES ETC	15,435	16,908	19,754	27,419	22,489	KG
4405	WOOD WOOL (EXCELSIOR); WOOD FLOUR	3,522	2,995	1,945	1,260	1,739	KG
4406	RAILWAY OR TRAMWAY SLEEPERS (CROSS-TIES) OF WOOD	1	6	28	39	27	CBM
4407	WOOD SAWN OR CHIPPED LENGTH, SLICED ETC, OV6MM TH	1,134	1,430	2,270	3,349	3,750	CBM
4408	VENEER SHEETS ETC, NOT OVER 6 MM THICK	343,772	323,575	488,064	516,446	383,364	KG
4409	WOOD, CONTINUOUSLY SHAPED (TONGUED, GROOVED ETC.)	13,777	25,282	33,603	15,372	10,547	KG
4410	PARTICLE BOARD & SIMILAR BOARD OF WOOD ETC.	87,123	102,521	129,318	199,638	247,356	KG
4411	FIBERBOARD OF WOOD OR OTHER LIGNEOUS MATERIALS	275,735	372,889	488,646	625,612	756,222	KG
4412	PLYWOOD, VENEERED PANELS & SIMILAR LAMINATED WOOD	1,516	1,574	1,448	1,044	842	CBM
4413	DENSIFIED WD BLOCKS/PLATES/STRIPS/PROFILE SHAPES	29,741	53,592	48,460	29,800	17,069	KG
4414	WOODEN FRAMES PAINTINGS, PHOTOGRAPHS, MIRRORS, ETC	428	265	262	193	220	KG
4415	PACKINGS ETC, WOOD; PALLETS, COLLARS ETC, OF WOOD	1,557	982	700	1,309	628	KG
4416	CASKS, BARRELS, VATS, ETC. AND PARTS, OF WOOD	241	239	111	149	170	KG
4417	TOOLS/TOOL & BROOM BODIES ETC SHOE LAST/TREES WOOD	1,293	926	881	1,679	2,164	KG
4418	BUILDERS' JOINERY AND CARPENTRY OF WOOD	22,007	66,656	42,040	25,825	10,776	KG
4419	TABLEWARE AND KITCHENWARE, OF WOOD	5,076	2,097	1,408	791	1,734	KG
4420	WOOD MARQUETRY ETC; JEWEL CASE ETC & WD FURN NESOI	392	678	612	550	836	KG
4421	ARTICLES OF WOOD, NESOI	14,680	33,286	37,002	38,157	15,862	KG

Source: World Trade Atlas: *China Customs*.

[141] For the year ended July.

Appendix 4.1 Specification of Craigpine Timber Limited Sawn Timber Grade.

- **Craigpine Clear**: ideally suited for uses where long length clear finish is required. Due to its light colour and clean appearance, Craigpine Clears grade requires a minimum of processing to achieve an excellent finish. Knot free on two faces and two edges. They are kiln dried to 8% to 12%. Sizes are 25 x75/100/150/200; 32 x 150/200; 40 x 75-100-150-200; 50 x 75-100-150-200 mm. Lengths are 1.8 m to 6.0 m.

- **Craigpine Premium Cuttings**: ideally suited for the manufacture of all quality furniture items. Specifications: 70% of the pieces will yield 60% and better of its length in clear cuttings with the minimum cutting 600 mm and longer. 30% of the pieces will yield 60% and better of its length in clear cuttings with the minimum cutting 1 m and longer. They are kiln dried to 8 to 12 %. Sizes are 25 x 75-100-150-200; 32 x 150-200; 40 x 75-100-150-200-250; 50 x 50-75-100-150-200; and 100 x 100. Lengths are 1.8 m to 6.0 m.

- **Craigpine Furniture**: ideally suited of the manufacture of furniture and appearance boards where a knotty finish is required. Excellent recoveries are achievable as this grade can be used in its entirety. Specifications: knots will not exceed 1/3 of the width. They are kiln-dried 8 % to 12 %. Sizes are available in 25 x 150-200; 40 x 100-150-200-250; 50 x 75-100-150-200; and 100 x 100 mm. Lengths are 1.8 m - 6.0m.

- **CraigPine Standard**: ideally suited for the manufacture of frame work, shelving, furniture, etc. Specifications: knots will not exceed half of the width. They are kiln-dried 8 % to 12 %. Sizes are 25 x 150-200; 40 x 100-150-200. Lengths are 1.8 m - 6.0 m.

- **CraigPine Industrial Grade**: a packaging and pallet making grade which is also suitable in the full length as supplied for temporary construction and other similar uses. Specifications: any number or combination of defects shall be permitted provided that the pieces shall hold together during the course of normal handling. They are kiln-dried at 8 - 12%. Sizes are 25 x 75-100-150-200; 40 x 150; 50 x 100. Lengths are 1.8m - 6.0m.

Appendix 6.1 Housing Construction Sector: Wood Processors – Importance Ranking with Respect to the Eight Determinant Factors.

Wood Processors			IMPORTANCE RANKING			
					95% Confidence Interval	
FACTOR		n	Mean	Standard deviation	*Lower*	*Upper*
A	Wood Properties	7	8.4	0.8	7.8	9.0
B	Price	6	9.0	0.0	9.0	9.0
C	Availability	7	7.3	0.5	6.9	7.6
D	Product Quality	4	7.3	0.5	6.8	7.7
E	Services	7	8.3	1.0	7.6	9.0
F	Environmental Issues	6	8.5	1.2	7.5	9.5
G	Customer Preferences	7	6.0	2.2	4.4	7.6
H	Experiences of Other Users	7	5.1	1.1	4.4	5.9

Appendix 6.2 Housing Construction Sector: Construction Contractors – Importance Ranking with Respect to the Eight Determinant Factors.

Construction Contractor			IMPORTANCE RANKING			
					95% Confidence Interval	
FACTOR		n	Mean	Standard deviation	*Lower*	*Upper*
A	Wood Properties	12	8.1	1.1	7.5	8.7
B	Price	12	8.8	0.6	8.5	9.2
C	Availability	12	8.2	0.9	7.6	8.7
D	Product Quality	12	6.9	1.0	6.4	7.5
E	Services	12	8.3	1.0	7.8	8.9
F	Environmental Issues	12	8.9	0.3	8.8	9.1
G	Customer Preferences	12	4.3	2.2	3.0	5.5
H	Experiences of Other Users	12	5.2	1.6	4.2	6.1

Appendix 6.3 Interior Decoration Sector: Interior Decoration Material Manufacturers – Importance Ranking with Respect to the Eight Determinant Factors.

Interior Decoration Sector			IMPORTANCE RANKING			
					95% Confidence Interval	
FACTOR		n	Mean	Standard deviation	*Lower*	*Upper*
A	Wood Properties	34	7.9	0.9	7.6	8.2
B	Price	34	9.0	0.0	9.0	9.0
C	Availability	34	7.1	1.1	6.7	7.4
D	Product Quality	34	7.8	1.4	7.3	8.3
E	Services	33	8.8	0.4	8.7	9.0
F	Environmental Issues	33	8.8	0.6	8.6	9.0
G	Customer Preferences	34	4.3	1.2	3.9	4.7
H	Experiences of Other Users	32	5.1	0.8	4.8	5.3

Appendix 6.4 Furniture Sector: Furniture Manufacturers – Importance Ranking with Respect to the Eight Determinant Factors.

FURNITURE SECTOR			IMPORTANCE RANKING			
					95% Confidence Interval	
FACTOR		n	Mean	Standard deviation	*Lower*	*Upper*
A	Wood Properties	46	7.6	0.83	7.4	7.8
B	Price	48	8.9	0.52	8.8	9.0
C	Availability	47	7.1	1.09	6.8	7.4
D	Product Quality	47	7.1	1.12	6.8	7.4
E	Services	47	8.2	1.08	7.9	8.5
F	Environmental Issues	49	8.9	0.40	8.8	9.0
G	Customer Preferences	45	3.8	1.32	3.4	4.2
H	Experiences of Other Users	50	5.9	0.90	5.6	6.1

Appendix 6.5 Procedures Used to Construct the Results in Figure 6.5 (*the relative importance rankings of the Eight Determinant Factors by Sector).*

1. By summarising the results from Figure 6.1, Figure 6.2, Figure 6.3, and Figure 6.4, the importance rankings of the eight determinant factors within each sector are:

Wood Processors	:	B > F > A ≈ E > C ≈ D > H > G
Construction Contractors	:	B > F > A ≈ C ≈ E > D > H > G
Interior Decoration Materials Manufacturers	:	B > F ≈ E > D ≈ A > C > H > G
Furniture Manufacturers	:	B > F > E > A > C ≈ D > H > G

2. By summarising the results in Table 6.2, the differences among different sectors at the 5% level are (*A to H refer to the importance ranking of the eight determinant factors*):

$A_{\text{Construction Contractors}} \approx A_{\text{Wood Processors}}$[142]	$> A_{\text{Interior Decoration Sector}}$ $> A_{\text{Furniture Sector}}$
$C_{\text{Construction Contractors}}$	$> C_{\text{Interior Decoration Sector}}$ $> C_{\text{Furniture Sector}}$
$D_{\text{Interior Decoration Sector}}$	$> D_{\text{Construction Contractors}} \approx D_{\text{Wood Processors}}$[143] $> D_{\text{Furniture}}$
$G_{\text{Wood Processors}}$	$> G_{\text{Construction Contractors}}$ $> G_{\text{Interior Decoration Sector}}$ $> G_{\text{Furniture Sector}}$
$H_{\text{Furniture Sector}}$	$> H_{\text{Interior Decoration Sector}}$ $> H_{\text{Wood Processors}} \approx H_{\text{Construction Contractors}}$[144]

3. By summarising these constraints in (1) and (2), *the relative importance rankings of the Eight Determinant Factors by Sector* in Figure 6.5 are constructed.

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[142] Assumption has been made that *A (Wood Properties)* is ranked equivalently the same between the wood processors and the construction contractors as their 95% confidence intervals are overlapped in Figure 6.1 and Figure 6.2.

[143] Assumption has been made that *D (Product Quality)* is ranked equivalently the same between the wood processors and the construction contractors as their 95% confidence intervals are overlapped in Figure 6.1 and Figure 6.2.

[144] Assumption has been made that *H (Experiences of Other Users)* is ranked equivalently the same between the wood processors and the construction contractors as their 95% confidence intervals are overlapped in Figure 6.1 and Figure 6.2.

Appendix 6.6 The Differences in Importance Ranking by Annual Turnover in 2001.

DIFFERENCES IN MEAN IMPORTANCE RANKINGS BY DIFFERENT LEVELS OF ANNUAL TURNOVER IN 2001		*Difference between means*	*ANOVA P-value*
A	**Wood Properties**		0.4198
B	**Price**		-
C	**Availability**		0.1340
D	**Product Quality**		0.5415
E	**Services**		0.4198
F	**Environmental Issues**		0.5761
G	**Customer Preferences**		0.4072
H	**Experiences of Other Users**		0.3405
All responded construction contractors stated that their annual turnover was more than RMB 50 million Yuan in 2001.			
A	**Wood Properties**		0.2707
B	**Price**		-
C	**Availability**		0.5628
D	**Product Quality**		0.3465
E	**Services**		0.6770
F	**Environmental Issues**		0.8130
G	**Customer Preferences**		0.1881
H	**Experiences of Other Users**		0.3911
A	**Wood Properties**		0.8866
B	**Price**		0.5240
C	**Availability**		0.7370
D	**Product Quality**		0.2019
E	**Services**		0.3726
F	**Environmental Issues**		0.5517
G	**Customer Preferences**		0.9329
H	**Experiences of Other Users**		0.4140
	RMB 10 to 50 million Yuan > Less than RMB 10 million Yuan	0.6889	<0.0500

Appendix 6.7 The Differences in Importance Ranking by Number of Employees.

DIFFERENCES IN MEAN IMPORTANCE RANKING BY THE DIFFERENT NUMBER OF EMPLOYEES IN 2001		*Difference between means*	*ANOVA P-value*
A	**Wood Properties**		0.4198
B	**Price**		-
C	**Availability**		0.1340
D	**Product Quality**		0.5415
E	**Services**		0.4198
F	**Environmental Issues**		0.5761
G	**Customer Preferences**		0.4072
H	**Experiences of Other Users**		0.3405
All responded construction contractors stated that their companies have than 100 employees.			
A	**Wood Properties**		0.4414
B	**Price**		-
C	**Availability**		0.3542
D	**Product Quality**		0.7827
E	**Services**		0.8976
F	**Environmental Issues**		0.7009
G	**Customer Preferences**		0.3764
H	**Experiences of Other Users**		0.5399
A	**Wood Properties**		0.9127
B	**Price**		0.3673
C	**Availability**		0.1288
D	**Product Quality**		0.0099
	30 to 100 employees > More than 100 employees	0.93	<0.0500
E	**Services**		0.4500
F	**Environmental Issues**		0.5182
G	**Customer Preferences**		0.2149
H	**Experiences of Other Users**		0.2264

Appendix 6.8 The Differences in Mean Importance Ranking by the Different Combinations of Annual Turnover and Number of Employees.

DIFFERENCES IN MEAN IMPORTANCE RANKINGS OF DIFFERENT COMBINATIONS OF THE DIFFERENT LEVELS OF ANNUAL TURNOVER & NUMBER OF EMPLOYEES		*Difference between means*	*ANOVA P-value*
A	**Wood Properties**		0.4198
B	**Price**		-
C	**Availability**		0.1340
D	**Quality of Wood Products**		0.5415
E	**Services**		0.4198
F	**Environmental Issues**		0.5761
G	**Customer Preferences**		0.4072
H	**Experiences of Other Users**		0.3405
All responded construction contractors stated that their companies have than 100 employees.			
A	**Wood Properties**		0.5499
B	**Price**		-
C	**Availability**		0.0702
	RMB 10 to 50 million Yuan with 30 to 100 employees > RMB 10 to 50 million Yuan with more than 100 employees	1.4	<0.0500
	More than RMB 50 million Yuan with more than 100 employees > RMB 10 to 50 million Yuan with more than 100 employees	1.3	<0.0500
D	**Quality of Wood Products**		0.1438
	RMB 10 to 50 million Yuan with more than 100 employees > RMB 10 to 50 million Yuan with 30 to 100 employees	1.6	<0.0500
	RMB 10 to 50 million Yuan with more than 100 employees > More than 50 million with more than 100 employees	2.0	<0.0500
E	**Services**		0.8495
F	**Environmental Issues**		0.4963
G	**Customer Preferences**		0.4033
H	**Experiences of Other Users**		0.6970
A	**Wood Properties**		0.9440
B	**Price**		0.6115
C	**Availability**		0.2354
D	**Quality of Wood Products**		0.0626
	Less than RMB 10 million Yuan with less 30 to 100 employees > RMB 10 to 50 million Yuan with more than 100 employees	1.5	<0.0500
	More than 50 million Yuan with more than 100 employees > RMB 10 to 50 million Yuan with more than 100 employees	1.4	<0.0500
E	**Services**		0.3583
F	**Environmental Issues**		0.1663
	Less than RMB 10 million Yuan with 30 to 100 employees > RMB 10 to 50 million Yuan with more than 100 employees	0.5	<0.0500
	More than RMB 50 million Yuan with more than 100 employees > RMB 10 to 50 million Yuan with more than 100 employees	0.5	<0.0500
G	**Customer Preferences**		0.0806
	RMB 10 to 50 million Yuan with more than 100 employees > More than 50 million Yuan with more than 100 employees	2.0	<0.0500
	RMB 10 to 50 million Yuan with more than 100 employees > RMB 10 to 50 million Yuan with 30 to 100 employees	2.1	<0.0500
H	**Experiences of Other Users**		0.1066
	RMB 10 to 50 million Yuan with 30 to 100 employees > Less than RMB 10 million Yuan with less 30 to 100 employees	0.7	

Appendix 6.9 Housing Construction Sector *(Wood Processors): frequency of sources of supply and customers.*

Frequency by Source of Supply

Importance ranking	Housing Construction Sector (*Wood Processors*): Sources of Supply										
	A	B	C	D	E	F	G	H	I	J	Total
1	3	0	0	3	1	0	0	0	0	0	7
2	2	0	3	0	0	2	0	0	0	0	7
3	1	2	0	2	0	1	0	0	0	1	7

Keys to the Sources of Supply for the Wood Processors and Construction Contractors:

A = Overseas exporters or forest companies
B = China Import and Export Corporation
C = Chinese wood products importers (state-owned)
D = Chinese wood products importers (private)
E = Chinese wood products manufacturers (wood processors)
F = Chinese wood product wholesalers
G = Chinese wood product retailers
H = Exhibition
I = Wood products trading centre
J = Other

Frequency by Customer

Importance Ranking	Housing Construction Sector (*Wood Processors*): Customers													
	A	B	C	E	E	F	G	H	I	J	K	L	M	Total
1	3	0	0	0	0	0	0	0	0	0	0	0	1	7
2	0	4	0	0	0	0	1	1	0	1	0	0	0	7
3	0	1	0	0	0	1	0	2	0	2	0	0	1	7

Keys to the Sources of Supply for the ***Wood Processors*** and ***Construction Contractors***:

A = Construction Contractors
B = Chinese construction materials wholesalers
C = Chinese construction material retailers
D = Foreign owned construction materials retailers or wholesalers
E =Exhibition
F = Chinese homebuyers
G = Foreign homebuyers
H = Overseas construction materials importers
I = Chinese wood product retailers
J = Chinese wood products manufactures
K = Wood products trading
L = China Import and Export Corporation
M= Developers

Appendix 6.10 Housing Construction Sector (Construction Contractors): *Source of Supply, Customers, Export Destinations, and End-Use Markets.*

Frequency by Source of Supply

Importance ranking	Housing Construction Sector (*Construction Contractors*): Sources of Supply										
	A	B	C	D	E	F	G	H	I	J	Total
1	0	0	0	4	5	1	0	0	0	0	10
2	0	0	0	3	4	3	0	0	0	0	10
3	1	0	0	3	1	5	0	0	0	0	10

Keys to the Sources of Supply for the Construction Contractors:

A = Overseas exporters or forest companies
B = China Import and Export Corporation
C = Chinese wood products importers (state-owned)
D = Chinese wood products importers (private)
E = Chinese wood products manufacturers (wood processors)
F = Chinese wood product wholesalers
G = Chinese wood product retailers
H = Exhibition
I = Wood products trading centre
J = Other

Frequency by Customer

Importance Ranking	Housing Construction Sector (*Construction Contractors*): Customers													
	A	B	C	E	E	F	G	H	I	J	K	L	M	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	10	10
2	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Keys to the Sources of Supply for the ***Construction Contractors***:

A = Construction Contractors
B = Chinese construction materials wholesalers
C = Chinese construction material retailers
D = Foreign owned construction materials retailers or wholesalers
E =Exhibition
F = Chinese homebuyers
G = Foreign homebuyers
H = Overseas construction materials importers
I = Chinese wood product retailers
J = Chinese wood products manufactures
K = Wood products trading
L = China Import and Export Corporation
M= Developers

Percentage of Total Annual Turnover in 2001 by End-Use Market

Type of Construction (*Percentage of floor spaces constructed of all construction in 2001.)*	Mean (in %)	Standard deviation (in %)	Frequency
State-owned housing units	14	9	4
Commercial housing units	79	7	5
Other	8	7	5

Appendix 6.11 Interior Decoration Sector: ***Source of Supply, Customers, Product Destinations, and End-Use Markets.***

Frequency by Source of Supply

Importance ranking	**Interior Decoration Sector:** Source of Supply										
	A	B	C	D	E	F	G	H	I	J	Total
1	10	0	1	20	0	1	0	0	0	1	33
2	21	0	0	10	1	1	0	0	0	0	33
3	0	0	0	1	1	29	0	0	0	0	31

Key to the Sources of Supply for the Interior Decoration Material Manufacturers

A = Overseas exporters or forest companies
B = China Import and Export Corporation
C = Chinese interior decoration materials importers (state-owned)
D = Chinese interior decoration materials importers (private)
E = Chinese wood products manufacturers (wood processors)
F = Chinese interior decoration materials wholesalers
G= Chinese interior decoration materials retailers
H = Exhibition
I = Wood Products trading centre
J = Other

Frequency by Customer

Importance Ranking	**Interior Decoration Sector:** Customers												
	A	B	C	D	E	F	G	H	I	J	K	L	Total
1	9	3	0	1	11	9	0	0	1	0	0	0	34
2	14	5	0	1	2	2	0	7	0	0	0	1	32
3	1	6	0	0	3	1	2	15	1	1	0	0	30

Key to the Interior Decoration Material Manufacturers' Customers

A = Interior decoration contractors
B = Chinese interior decoration materials wholesalers
C = Exhibition
D = Foreign owned interior decoration materials wholesalers or retailers
E = Properties owners
F = Overseas interior decoration materials importers
G= Chinese interior decoration materials retailers
H = Chinese interior decoration materials exporters
I = Wood Products manufacturers
J = Wood product trading centre
K = China Import & Export Corporation
L = Other

Frequency by Product Destinations

Importance ranking	Frequency of Major Product Destinations					
	US	Japan	EU	Hong Kong	Domestic	Total
1	5	0	6	3	22	36
2	5	0	4	18	4	31
3	5	0	3	6	4	18

Frequency by End-Use Market

Importance ranking	Product Destinations				
	Hotels, restaurants, and malls	Commercial offices	Residential	Leisure facilities	Total
1	1	3	23	0	27
2	14	10	3	0	27
3	9	14	1	0	24

Appendix 6.12 Furniture Sector: ***Source of Supply, Customers, Product Destinations, and End-Use Markets.***

Frequency by Source of Supply

Importance ranking	Sources of Supply										
	A	B	C	D	E	F	G	H	I	J	Total
1	4	0	0	47	1	0	0	0	0	0	52
2	44	0	0	5	0	3	0	0	0	0	52
3	3	0	0	0	0	47	1	0	0	0	51

Key to the Sources of Supply for the Interior Decoration Material Manufacturers

A = Overseas exporters or forest companies
B = China Import and Export Corporation
C = Chinese wood products importers (state-owned)
D = Chinese wood products importers (private)
E = Chinese wood products manufacturers (wood processors)
F = Chinese wood products wholesalers
G = Chinese wood products retailers
H = Exhibition
I = Wood Products trading centre
J = Other

Frequency by Customer

Importance Ranking	Customer											
	A	B	C	E	E	F	G	H	I	J	K	Total
1	0	47	0	0	0	5	0	0	0	0	0	52
2	0	3	0	0	0	12	0	37	0	0	0	52
3	0	1	0	0	4	32	2	12	0	0	0	51

Key to the Furniture Manufacturers' Customers

A = China Import & Export Corporation
B = Overseas furniture importers
C = Overseas furniture retailers
D = Exhibition
E = Chinese furniture buyers
F = Chinese furniture wholesalers
G = Chinese furniture retailers
H = Chinese furniture exporters
I = Chinese Wood Products manufacturers
J = Wood product trading centre
K = Other

Frequency by Product Destination

Importance ranking	Product Destinations						
	US	Japan	EU	Hong Kong	Domestic	Middle East	Total
1	33	1	12	0	6	0	52
2	12	2	25	11	2	0	52
3	3	6	5	13	20	2	47

Frequency by End-Use Market

Importance ranking	End-Use Market			
	Hotels, restaurants, and malls	Commercial offices	Residential	Total
1	4	9	38	51
2	42	6	3	51
3	5	36	10	51

Appendix 7.1 Nominal GDP and Real GDP per Capita in China (at 1999 Prices).

Year	**Nominal GDP** (in billion RMB Yuan)	**GDP Index** (base = 100 in 1999)	**Real GDP** in billion RMB Yuan (at 1999 Prices)	**Population** (in billion)	**Real GDP per Capita** in RMB Yuan (at 1999 Prices)
1987	1,196	43	2809	1.09	2570
1988	1,492	48	3125	1.11	2815
1989	1,691	52	3250	1.13	2883
1990	1,855	55	3376	1.14	2953
1991	2,162	59	3687	1.16	3184
1992	2,664	63	4212	1.17	3595
1993	3,463	72	4779	1.19	4032
1994	4,676	87	5383	1.20	4491
1995	5,848	98	5949	1.21	4912
1996	6,789	104	6520	1.22	5327
1997	7,446	105	7095	1.24	5739
1998	7,835	102	7645	1.25	6126
1999	8,191	100	8191	1.26	6506
2000	8,940	101	8878	1.28	6956

Source: Asian Demographics Limited (2001); China State Statistical Bureau (2001)[145]; and International Monetary Fund (2002).

[145] Source: China State Statistical Bureau (2001). (http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/200203310045.htm) [10 March 2002] (*in Chinese*)

Appendix 7.2 The Apparent Consumption per Thousand Capita, and Real Average Export and Import Prices in China from FAOSTAT between 1987 and 2000.

The Apparent Consumption (in m^3) Per Thousand Capita

Year	All Industrial Roundwood	Coniferous Roundwood	Non-Coniferous Roundwood	All Sawnwood	Coniferous Sawnwood	Non-coniferous Sawnwood	Fibreboard	Plywood	Particleboard	Veneer Sheet	All Wood-Based Panels
1987	.	.	.	25.31	15.62	9.69	1.13	2.24	0.53	0.09	3.97
1988	.	.	.	24.99	15.45	9.55	1.37	2.29	0.60	0.10	4.36
1989	.	.	.	23.50	14.44	9.06	1.30	2.54	0.53	0.10	4.48
1990	84.73	53.68	31.06	21.17	13.19	7.99	1.26	2.66	0.52	0.08	4.53
1991	82.79	51.41	31.38	18.82	10.29	8.52	1.29	3.15	0.69	0.13	5.27
1992	84.42	51.87	32.56	17.92	10.14	7.80	1.48	4.19	1.16	0.42	7.24
1993	86.37	53.95	32.42	23.25	13.57	9.67	1.84	4.41	1.62	0.30	8.16
1994	86.29	53.35	32.96	22.73	13.42	9.31	2.05	5.15	1.63	0.45	9.27
1995	87.21	53.93	33.28	22.77	13.17	9.60	2.19	9.18	3.74	0.49	15.62
1996	92.09	56.84	35.25	23.80	13.91	9.88	2.38	6.47	3.05	0.49	12.39
1997	90.92	55.89	35.03	19.51	10.72	8.79	3.31	8.25	3.30	0.67	15.53
1998	90.21	55.77	34.44	16.92	9.40	7.53	3.04	5.84	2.51	0.63	12.03
1999	87.77	54.15	33.62	15.45	8.24	7.21	4.36	7.68	2.28	0.53	14.84
2000	87.02	53.69	33.34	15.32	8.17	7.14	4.33	7.61	2.27	0.52	14.72
Real Average Export Price (in 1999 prices) in US$/$m^3$ f.o.b.											
1987	190	.	.	588	376	605	349	415	772	1091	748
1988	186	.	.	414	342	424	544	437	931	771	873
1989	188	.	.	530	397	550	609	390	756	985	743
1990	187	198	175	517	398	551	544	374	698	827	674
1991	187	176	194	565	385	615	519	330	603	635	582
1992	176	148	187	335	194	393	473	279	552	461	525
1993	218	166	241	355	208	414	449	255	588	399	531
1994	184	107	204	331	170	406	343	237	475	435	443
1995	163	111	174	351	275	377	215	244	397	358	357
1996	153	88	163	311	251	329	179	214	388	333	330
1997	164	85	178	278	184	311	156	197	383	334	304
1998	141	67	161	278	203	308	143	180	324	260	252
1999	118	62	155	285	198	311	146	187	347	248	257
2000	130	60	180	287	171	317	147	175	337	261	238
Real Average Import Price (in 1999 prices) in US$/$m^3$ c.i.f.											
1987	779	.	.	923	1940	680	351	1013	1614	2609	1032
1988	871	.	.	915	3259	720	591	1077	1513	2638	1102
1989	492	.	.	830	3078	612	602	996	697	858	983
1990	175	185	174	794	2849	610	711	806	543	1214	797
1991	147	70	176	671	1597	548	410	751	346	1172	700
1992	139	114	152	409	667	367	279	662	273	1218	621
1993	162	148	167	604	1013	549	654	672	310	590	627
1994	167	109	191	498	602	482	346	550	273	638	517
1995	213	383	189	534	546	531	191	482	278	659	453
1996	314	224	325	456	668	435	174	482	286	464	434
1997	281	291	280	448	599	429	418	405	276	382	393
1998	289	252	293	455	519	445	379	346	226	271	322
1999	298	249	309	493	533	485	389	352	231	261	322
2000	296	324	294	493	518	485	346	295	240	307	299

Source: FAO (2001) Food and Agriculture: FAOSTAT statistical database- forestry. (http://apps.fao.org/page/collections?subset=forestry) [15 November 2001]

Appendix 8.1 Wood Products Subject to Designated Trading by HS Code.[146]

ANNEX 2B

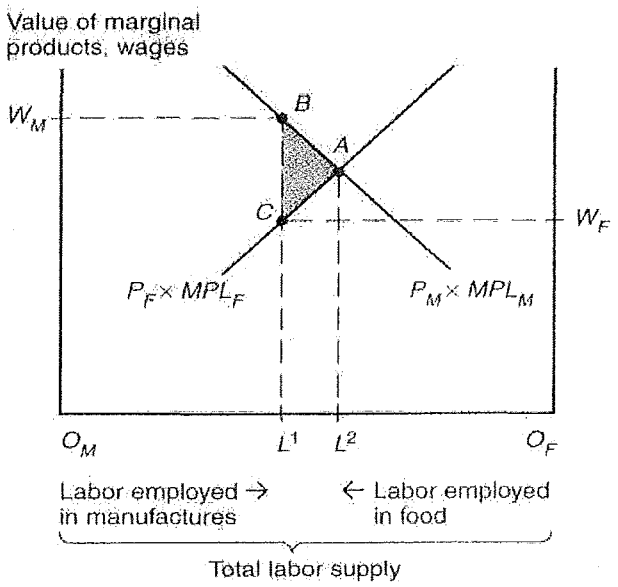
PRODUCTS SUBJECT TO DESIGNATED TRADING

PRODUCTS	NO	HS NO	DESCRIPTION OF PRODUCTS	LIBERALIZATION PROGRAM
TIMBER	5	44020000	Wood charcoal (incl. shell or nut charcoal), whether or not agglomerated	Liberalized within 3 years after accession.
	6	44031000	Wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, treated with paint, stains, creosote or other preservatives	
	7	44032000	Coniferous wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	8	44034910	Teak wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	9	44034990	Specified tropical wood in the rough, nes, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	10	44039100	Oak (Quercus spp.) wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	11	44039200	Beech (Fagus spp.) wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	12	44039910	Nan mu (Phoebe) wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	13	44039920	Camphor wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	14	44039930	Rosewood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	15	44039940	Kiri (Paulownia) wood in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	16	44039990	Wood, nes, in the rough, whether or not stripped of bark or sapwood, or roughly squared, excl. treated with preservatives	
	17	44041000	Hoopwood; split poles; piles, pickets and stakes of wood, pointed but not sawn lengthwise; wooden sticks, roughly trimmed but not turned, bent or otherwise worked; chipwood and the like, coniferous	

[146] Source: World Trade Organization. 2002. (www.wto.org) [5 January 2003]

PRODUCTS	NO	HS NO	DESCRIPTION OF PRODUCTS	LIBERALIZATION PROGRAM
	18	44042000	Hoopwood; split poles; piles, pickets and stakes of wood, pointed but not sawn lengthwise; wooden sticks, roughly trimmed but not turned, bent or otherwise worked; chipwood and the like, non-coniferous	
	19	44050000	Wood wool; wood flour	
	20	44061000	Railway or tramway sleepers (cross-ties) of wood, not impregnated	
	21	44069000	Railway or tramway sleepers (cross-ties) of wood, impregnated	
	22	44071000	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, conifers	
	23	44072400	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, Virola, Mahogany (Swietenia spp.), Imbuia and Balsa	
	24	44072500	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, Dark Red Meranti, Light Red Meranti and Meranti Bakau	
	25	44072600	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, White Lauan, White Meranti, White Seraya, Yellow Meranti and Alan	
	26	44072910	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm,Teak wood	
	27	44072990	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, specified tropical woods nes	
	28	44079100	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, Oak (Quercus spp.) wood	
	29	44079200	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, Beech (Fagus spp.) wood	
	30	44079910	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, Nan mu, Camphor wood or Rosewood	
	31	44079920	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, Paulownia wood	
	32	44079990	Wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm, wood nes	
PLYWOOD	33	44121300	Plywood consisting solely of sheets of wood, each ply not exceeding 6mm thickness, with at least one outer ply of tropical wood specified	Liberalized within 3 years after accession.
	34	44121400	Plywood consisting solely of sheets of wood, each ply not exceeding 6mm thickness, with at least one outer ply of non-coniferous wood	
	35	44121900	Plywood consisting solely of sheets of wood, each ply not exceeding 6mm thickness, nes	

Appendix 8.2 The Effect of Wage Differential through the Allocation of Labours in Two Sectors.



Notes:
Vertical axis represents wage rates.
Horizontal axis represents employment.

O_M = the origin of employment in the manufacture sector.
O_F = the origin of employment in the food sector.
P_M = the price of manufactures.
P_F = the price of food.
MPL_M = the marginal product of labour in manufacture sector.
MPL_F = the marginal product of labour in food sector.

Point A = the most efficient allocation of labour among the manufacture and food sectors.
Point B = the wage rate of W_M when L^1 is allocated to the manufacture sector.
Point C = the wage rate of W_F when L^2 is allocated to the food sector.

Source: Krugman & Obstfeld (2000)

Point A is the most efficient allocation of labour is at L^2 where $W_M = W_F$. When dualism is occurred in an economy, allocation of labour will be at L^1 where the labourers in manufacturing sector receive their wage rate at W_M (**point B**) and labourers in the food sector receive their wage rate at W_F (**point C**). The concept of correcting the dualism economy is to allocate the surplus labour from the food sector to the manufacture sector from L^1 to L^2.